

Neuro Developmental Disorder in Adolescence

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Neurodevelopmental disorders

- ▶ characterized by developmental deficits causing impairments of
 - personal
 - social
 - academic or
 - occupational functioning



Neurodevelopmental disorders

- ▶ Intellectual disabilities
- ▶ Communication disorder
- ▶ Autism spectrum disorder
- ▶ Attention deficit hyperactivity disorder
- ▶ Motor disorder
- ▶ Specific learning disorder
- ▶ Others



Intellectual Disabilities

- ▶ known as general learning disability/mental retardation
- ▶ 3 diagnostic criteria (DSM-IV):
 1. significant limitation in intellectual functioning
 2. significant limitation in adaptive behavior (communication, self-help/ interpersonal skills, etc)
 3. became apparent in childhood or adolescence
- ▶ usually have an IQ below 70

American Psychiatric Association (2013)

Children with intellectual disabilities and other developmental conditions competing in the Special Olympics



Special Olympics USA team in July 2019



Down syndrome

Communication disorder (CD)

- ▶ affects an individual's ability to comprehend, detect, or apply language and speech^{1,2}

1. Collins, John William. "The greenwood dictionary of education". Greenwood, 2011

2. Gleason, Jean Berko (2001)

The DSM–5 diagnoses for CD

- ▶ **Language disorder:** difficulties in learning and using language i.e. problems with vocabulary /grammar/ putting sentences together in a proper manner. Can be receptive /expressive
- ▶ **Speech sound disorder (phonological disorder):** problems with pronunciation and articulation of their native language
- ▶ **Childhood–Onset Fluency Disorder (Stuttering)**
- ▶ **Social (pragmatic) communication disorder–** difficulties in verbal and nonverbal communication (in ASD– a restricted/ repetitive pattern of behavior)

American Psychiatric Association (2013)

Lee ASY, Gibbon FE (2015)

Childhood-onset fluency disorder (stuttering)

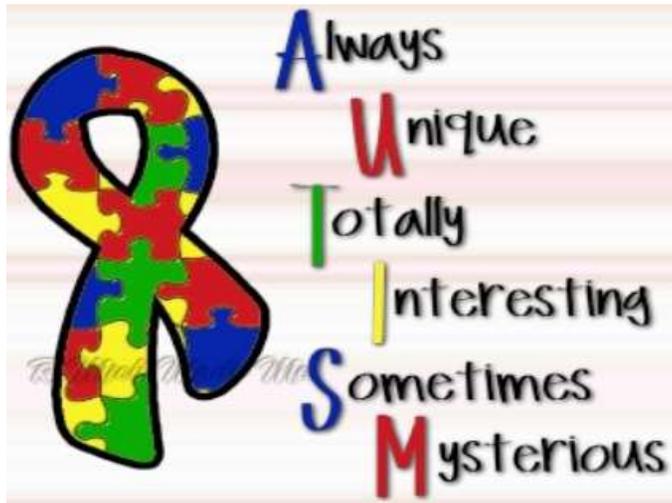
- ❖ standard fluency and rhythm is interrupted
- ❖ repetition/ prolongation of whole words/syllables
- ❖ pauses within a word and/or
- ❖ avoidance of pronouncing difficult words and use of easy words

American Psychiatric Association. "Diagnostic and Statistical Manual of Mental Disorders Fifth Edition"



Autism Spectrum Disorder (ASD)

- ▶ “Autism is a developmental disorder that appears in the first 3 years of life, affects the brain’s normal development of social and communication skills”- Brittany Allen



AUTISM / ASD FACTS

cognitive difficulties are very common

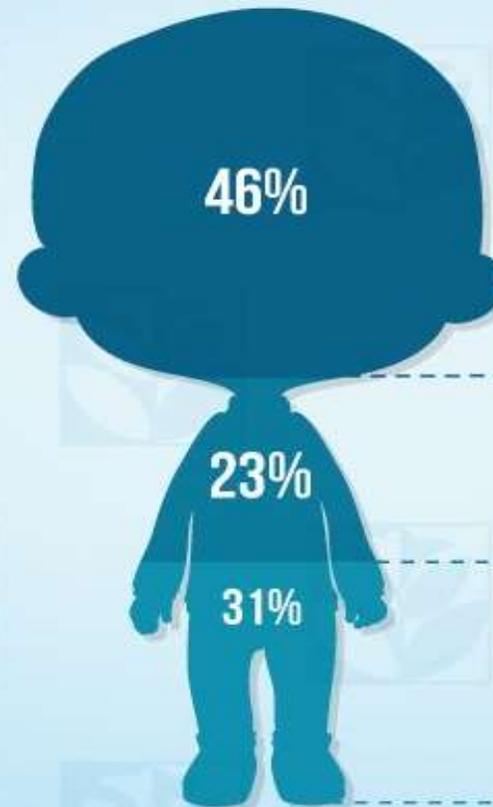
AUTISM IS ON THE RISE



1/88 IN 2012 **30% INCREASE** **1/68** IN 2014



1% OF THE WORLD POPULATION HAS AUTISM SPECTRUM DISORDER



AVERAGE OR ABOVE
IQ >85



BORDERLINE
IQ = 71-85



INTELLECTUAL
DISABILITY
IQ <70



intellectual disability is identifiable in 25–50% cases

Prevalence

- ▶ in 2000, 1–2/1,000¹, & in 2015, 24.8 million affected globally²
- ▶ In developed countries, about 1.5% of children are diagnosed in 2017³
- ▶ males 4–to–5 times are common than females: ⁴

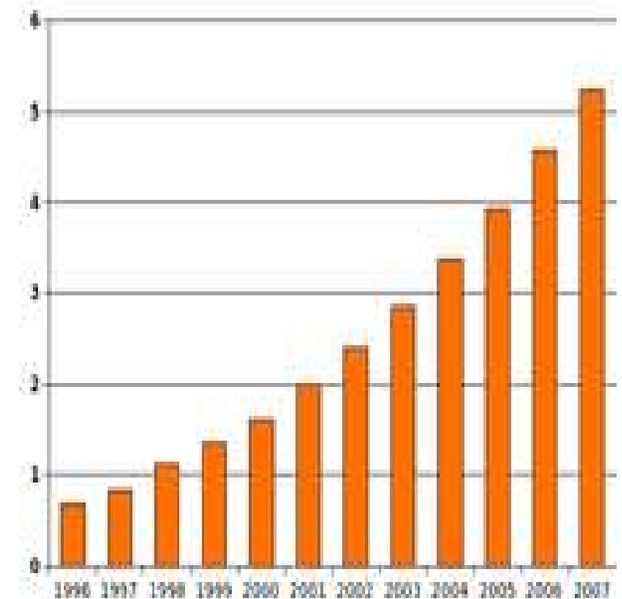
1. Newschaffer CJ. 2007

2. Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. American Psychiatric Publishing; 2013.

3. Lyall K. 2017

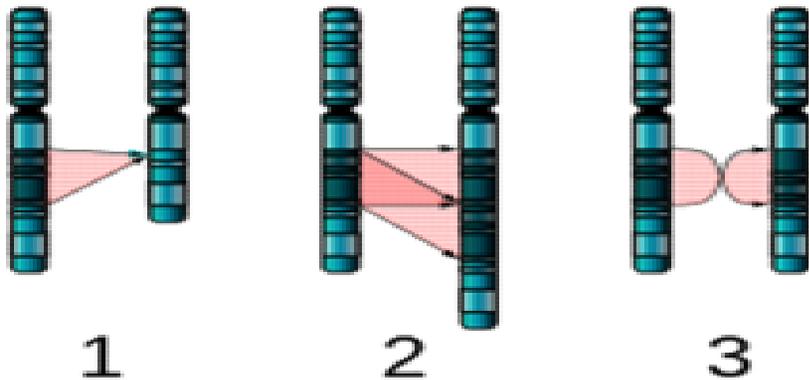
4. "ASD data and statistics". CDC. 2016

Reports of autism cases per 1,000 children grew dramatically in the US from 1996 to 2007



Genetic architectures

- ▶ has a strong genetic basis
- ▶ about 25 times higher in siblings of affected children
- ▶ genetic architecture of ASD is very complex



deletion (1), duplication (2) and inversion (3)

chromosome abnormalities implicated in autism

Beaudet AL (May 2007). "Autism: highly heritable but not inherited". *Nature Medicine*. **13** (5): 534-536.



Risk factors & possible aetiologies



- ▶ gestational age <35 weeks
- ▶ birth defect
- ▶ cerebral palsy
- ▶ use of valproate, SSRI during pregnancy
- ▶ obstetric complication
- ▶ Fragile X syndrome, Muscular dystrophy, Neurofibromatosis, Tuberosus sclerosis
- ▶ vaccination such as MMR?
- ▶ exposure to mercury in tooth fillings

Clinical characteristics

- 1) abnormalities of social development
- 2) abnormalities of communication
- 3) restricted repetitive behaviors



Abnormalities of social development

- ▶ autistic aloneness (unable to form warm emotional relationships with people)
- ▶ don't respond to parent's affectionate behavior by smiling or cuddling
- ▶ dislike being picked up or kissed by parents
- ▶ don't show interest in other children
- ▶ avoid eye-to-eye contact

- Volkmar FR, etal. (2014)
- Sigman M, Dijamco A, Gratier M, Rozga A (2004)



Abnormalities of communication

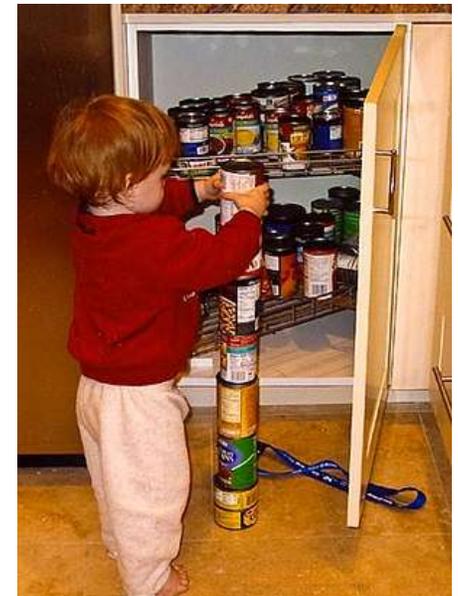
- ▶ **speech** may develop later or never appear
- ▶ occasionally speak normally until 2 years & then disappear in part or completely
- ▶ 50% may acquire some useful speech with **echolalia & misuse of pronoun**
- ▶ may be **talkative with repetitive monologue** rather than a conversation

- Landa R (2007)
- Tager-Flusberg H, Caronna E (2007)

Restricted repetitive behaviors

- ▶ obsessive desire for sameness e.g. food, cloth, games
- ▶ odd motor behaviors & mannerisms
 - i. whirling round & round
 - ii. twiddling fingers
 - iii. flapping their hands

Lam KS, Aman MG (2007)

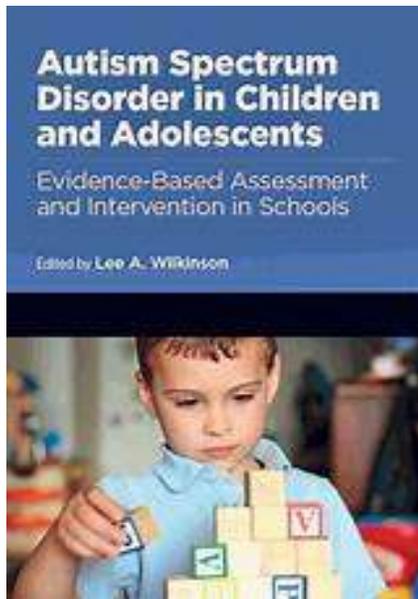


Repetitively stacking or lining up objects

Other features

- ▶ sudden anger or fear without any apparent reason
 - ▶ may be overactive or distractible, sleep badly or soil or wet themselves
 - ▶ 25% of autistic develop seizures, usually in the adolescence
- 

Assessment tool



- ▶ Autism Diagnostic Observation Schedule (ADOS)
- ▶ Diagnostic Interview for Social & Communication Disorders (DISCO)
- ▶ The Development, Dimensional, & Diagnostic Interview (3di)
- ▶ Child Autism Rating Scale (CARS)

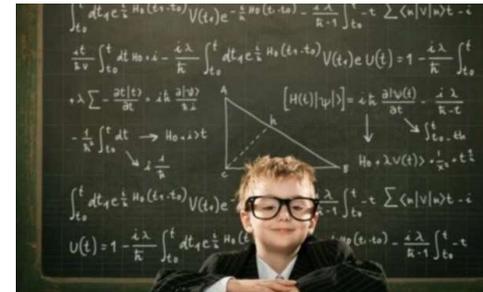
Differential diagnosis

- ▶ Language disorder
- ▶ Communication disorder
- ▶ Intellectual disability
- ▶ Mental & behavioral disorder
- ▶ Deafness
- ▶ Rett syndrome (condition with developmental regression)



Predictors of better outcome

- ▶ Higher IQ
- ▶ Presence of useful speech



How to treat ASD

- ▶ highly individualized
- ▶ no drugs licensed to treat
- ▶ treatments based on underlying genetic & neural mechanisms are under research
- ▶ to reduce the core symptoms & behaviors of ASD
- ▶ treating co-morbidities



Management of abnormal behaviors

- ▶ behavioral therapy is the mainstay treatment
- ▶ strategies for parents, teachers & caregivers to improve skills & reciprocal communication
- ▶ vocational programs
- ▶ sensory integration therapy: may reduce sensitivity to touch, light, balance, or hearing
- ▶ auditory integration therapy: can help to improve auditory processing deficits and concentration
- ▶ music therapy

Susan E. Levy and Susan L. Hyman. NCBI. (2009)



Diets

- ▶ Amino acids: taurine, carnosine¹
- ▶ B6/magnesium supplements ¹
- ▶ Casein and gluten free diets²
- ▶ reduced consumption of sugar and fat containing processed foods
- ▶ omega-3 fatty acids to reduce repetitive behavior, & hyperactivity
- ▶ consumption of more fruits and vegetables (sulforaphane: in cruciferous vegetables)³

¹Susan E. Levy and Susan L. Hyman. NCBI. (2009)

²"Complementary and Alternative Medicine Treatments for Children with Autism Spectrum Disorders." Autism Speaks. (2015)

³Devon Frye. Additude Magazine. (2014)



Use of antipsychotic medication

- ▶ start low & go slow, short periods only, 3 main classes:
 - ❖ **stimulants (Methylphenidate)**: with ADHD can be used
 - ❖ **antidepressant and anxiety medications**: with persistent anxiety and obsessive behaviors like running away from new situations, compulsive checking or washing
e.g. SSRIs such as sertraline or fluoxetine
 - ❖ **atypical antipsychotics**: for motor restlessness, repetitive behaviors, and sleep disturbance
e.g. aripiprazole, quetiapine, and risperidone



Educational issues

- ▶ 10–20% begin to improve between the ages of 4–6 years (can attend ordinary school & obtain work)
- ▶ 10–20% can live at home, need to attend special school & remain very dependent
- ▶ remainder improve very little & vocational training & residential supports is essential

A 3-year-old with autism points to fish in an aquarium, intensive shared-attention training on language development



Attention Deficit Hyperactivity Disorder (ADHD)

DSM-V Criteria's

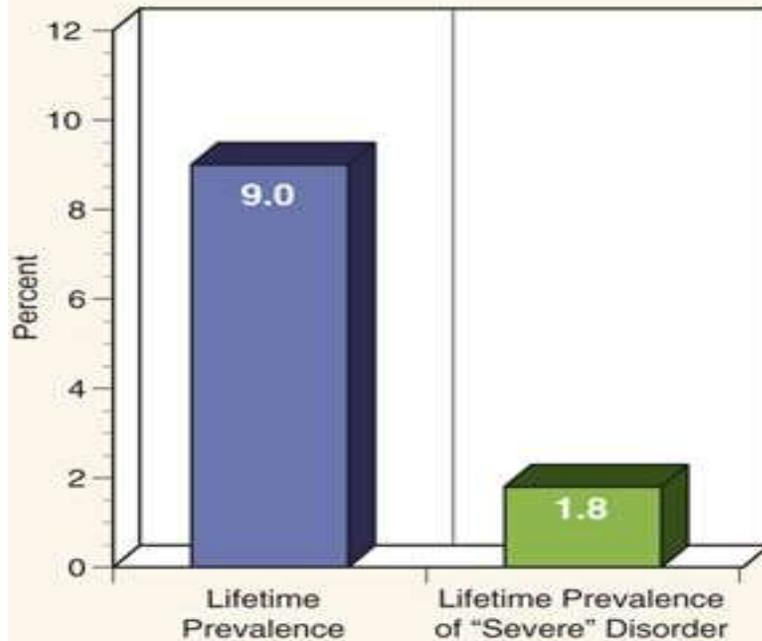
- ▶ a persistent pattern of inattention &/or hyperactivity-impulsivity
- ▶ that interferes with functioning or development



ADHD

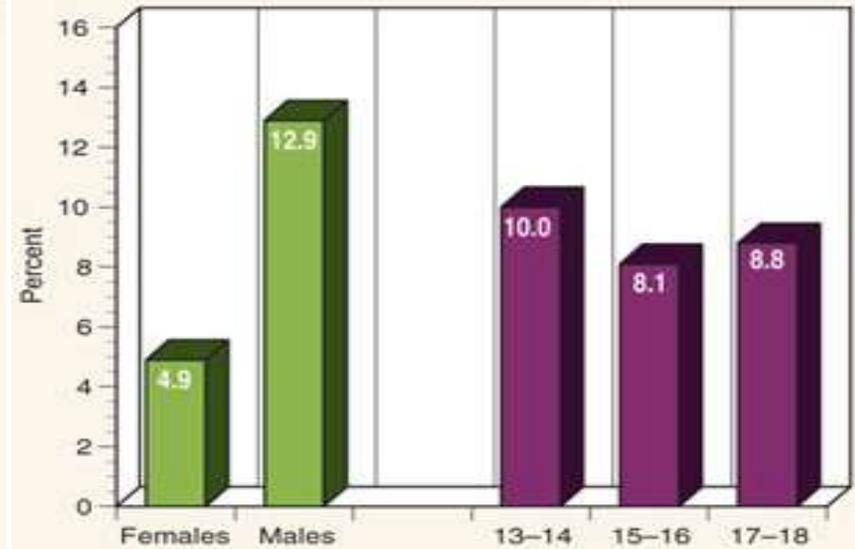
Lifetime Prevalence of 13 to 18 year olds

Lifetime Prevalence: 9.0% of 13 to 18 year olds
Lifetime Prevalence of "Severe" Disorder: 1.8% of 13 to 18 year olds have a "severe" disorder



Demographics (for lifetime prevalence)

• Sex and Age



• Race: Not Reported

Merikangas KR, He J, Burstein M, Swanson SA, Avenevoli S, Cui L, Benjet C, Georgiades K, Swendsen J. Lifetime prevalence of mental disorders in U.S. adolescents: Results from the National Comorbidity Study-Adolescent Supplement (NCS-A). *J Am Acad Child Adolesc Psychiatry*. 2010 Oct;49(10):980-989.

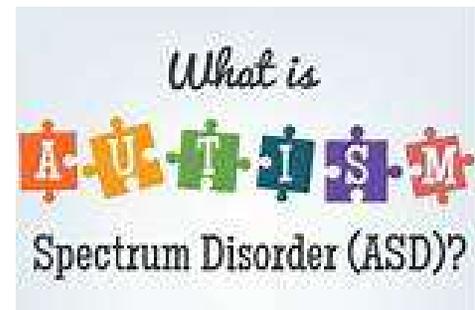
2nd most common psychiatric disorder of childhood

ADHD

- ▶ Factors involved in the development of ADHD include:
 - ❖ genetic factors: make up about 75% of the risk¹
 - ❖ environmental/ toxins²:
 - ❖ lead exposure during childhood
 - ❖ smoking, alcohol use during pregnancy
 - ❖ prematurity

1) Demontis D, 2018

2) Tiesler, Carla M. T.; Heinrich, Joachim, 2014



Inattention

▶ 6/9 for 6 month, hampering the social, academic/occupational activities:

1. fails to give **close attention**/ makes careless mistakes in schoolwork/ other activities
2. difficulty **sustaining attention** in tasks
3. **mind seems elsewhere** while spoken directly
4. start tasks but quickly **loses focus** & easily sidetracked
5. difficulty managing **sequential tasks**
6. **avoids tasks** that require sustained mental effort
7. **loses necessary things** very often
8. **easily distracted** by external stimuli
9. **forgetful** in daily activities

Hyperactivity–Impulsivity

- ▶ 6/9 for 6 month hampering the social, academic/occupational activities:

1. **taps hands or feet** or squirms in seat
2. **leaves seat** when remaining seated is expected
3. **run about or climbs** where it is inappropriate.
4. unable to play or engage in leisure activities quietly
5. often 'On the go' acting as if 'driven by a motor'
6. talks excessively
7. often blurts out an answer before a question has been completed
8. often has difficulty waiting his or her time while waiting in line
9. often interrupt others

Treatment

- ▶ psychological counseling
- ▶ medication
- ▶ education
- ▶ skills training and
- ▶ dietary advices



Psychosocial interventions

- ▶ 1st step of management
- ▶ behavioral interventions
- ▶ social skills training, cognitive training , specific classroom interventions
- ▶ supporting the parents, teachers & other caregivers



Medication

➤ Stimulant Drug:

- ❖ are the treatment of choice
- ❖ methylphenidate (Ritalin), amphetamine, dexamphetamine
- ❖ boost and balance levels of neurotransmitters
- ❖ methylphenidate improves symptoms & reduce risk of unintentional injuries

➤ Non-stimulant medications:

- atomoxetine, bupropion, guanfacine, and clonidine may be used as alternatives, or added to stimulant therapy

Dietary advices

- ▶ free fatty acid supplementation
- ▶ restriction of artificial food colorants
- ▶ avoiding certain foods that is observed to increase the behaviors

- ▶ Pelsser LM, 2017, PLoS One; 12(1): **NO ROLE**
“Diet and ADHD, Reviewing the Evidence: A Systematic Review of Meta-Analyses of Double-Blind Placebo-Controlled Trials Evaluating the Efficacy of Diet Interventions on the Behavior of Children with ADHD”



Prognosis

persists into adulthood in about 30–50% of cases

- ▶ poor school or work performance
- ▶ unemployment
- ▶ financial problems
- ▶ trouble with the law
- ▶ alcohol or other substance misuse
- ✓ frequent car accidents or other accidents
- ✓ unstable relationships
- ✓ poor physical and mental health
- ✓ poor self-image
- ✓ suicide attempts

Motor disorder

- ▶ developmental coordination disorder
 - ▶ stereotypic movement disorder
 - ▶ Tic disorder
 - ▶ other specified tic disorder
- 

Developmental coordination disorder

- deficits in acquisition and execution of coordinated motor skills
- clumsiness and slowness or inaccuracy of performance of motor skills
- causes interference with daily activities



Stereotypic movement disorder

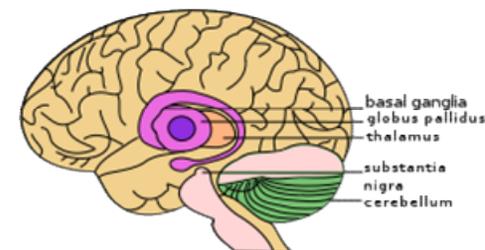
- ▶ repetitive and apparently purposeless motor behaviors, such as hand flapping, body rocking, head banging, self-biting, or hitting
- ▶ interfere with social, academic, or other activities



Tic disorder

- ▶ A tic is a sudden, rapid, recurrent, non-rhythmic, stereotyped motor movement or vocalization, 3 types:
 - ❖ a) simple: short duration e.g. head jerking, squinting, blinking, shrugging, grimacing, nose-twitching, repeated foot tapping, leg jerking, scratching
 - ❖ b) complex tics include: kissing, pinching, sticking out the tongue or lip-smacking, making rude gestures
 - ❖ c) Tourettes's disorder

Basal Ganglia and Related Structures of the Brain

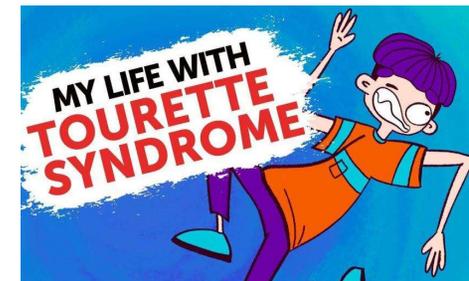


Tourettes's disorder (TD)

- ▶ causes repeated tics
- ▶ sudden, uncontrolled vocal sounds or muscle jerks
- ▶ 10% have coprolalia (involuntary use of bad language)
- ▶ 1% of school age children have TD
- ▶ symptoms often begin between ages 5 and 10
- ▶ boys are more affected (3-4: 1), more severe & chronic
- ▶ overall prognosis is good
- ▶ but in a minority with severe symptoms may persist into adulthood
- ▶ in some cases, may need special classes, psychotherapy, or medicine



Georges Gilles de la Tourette
(1857-1904)



Specific learning disorder

- ▶ first manifests during the years of schooling
 - ▶ persistent and impairing difficulties with learning foundational academic skills in reading, writing, and/or math
 - ▶ the individual's performance is well below average for age, or acceptable performance levels are achieved only with extraordinary effort
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Thank You

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