

18<sup>th</sup> International Conference on Tourette Syndrome & Tic Disorders



LJUBLJANA

Tuesday, 16 June 2026

13:00-18:00

Grand Hotel Union Eurostars

# TS-school

## Training course on Tourette syndrome

hybrid

- Diagnosis and definition of tic disorders
- Nature of tics, Course of TS
- Comorbidities - Focus on OCD
- Differential diagnoses
- Assessments
- Pathophysiology including genetics
- Treatment

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European Society for the Study of Tourette Syndrome | [essts.org](https://essts.org)

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 Wednesday, 16 June 2026, 13:00-18:00

## Tourette syndrome & comorbidities

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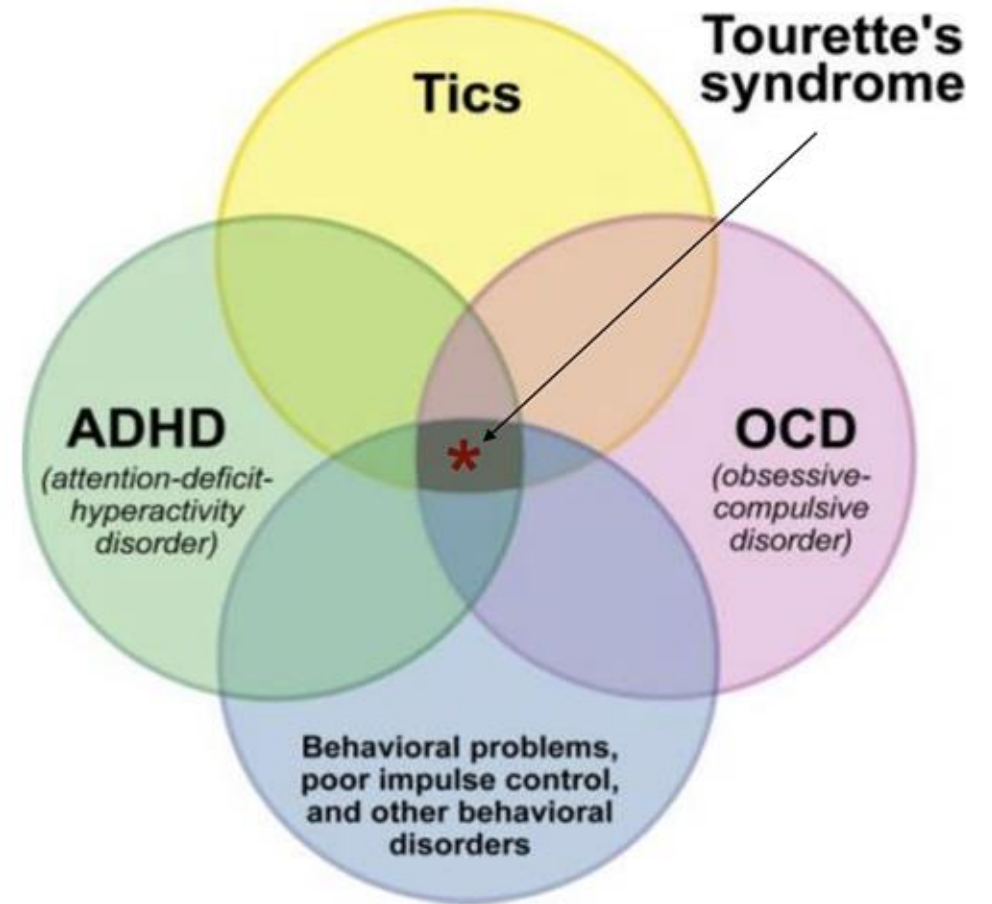
# Tourette syndrome (TS) - more than 'just' a movement disorder

*JAMA Psychiatry*. 2015 April 1; 72(4): 325–333. doi:10.1001/jamapsychiatry.2014.2650.

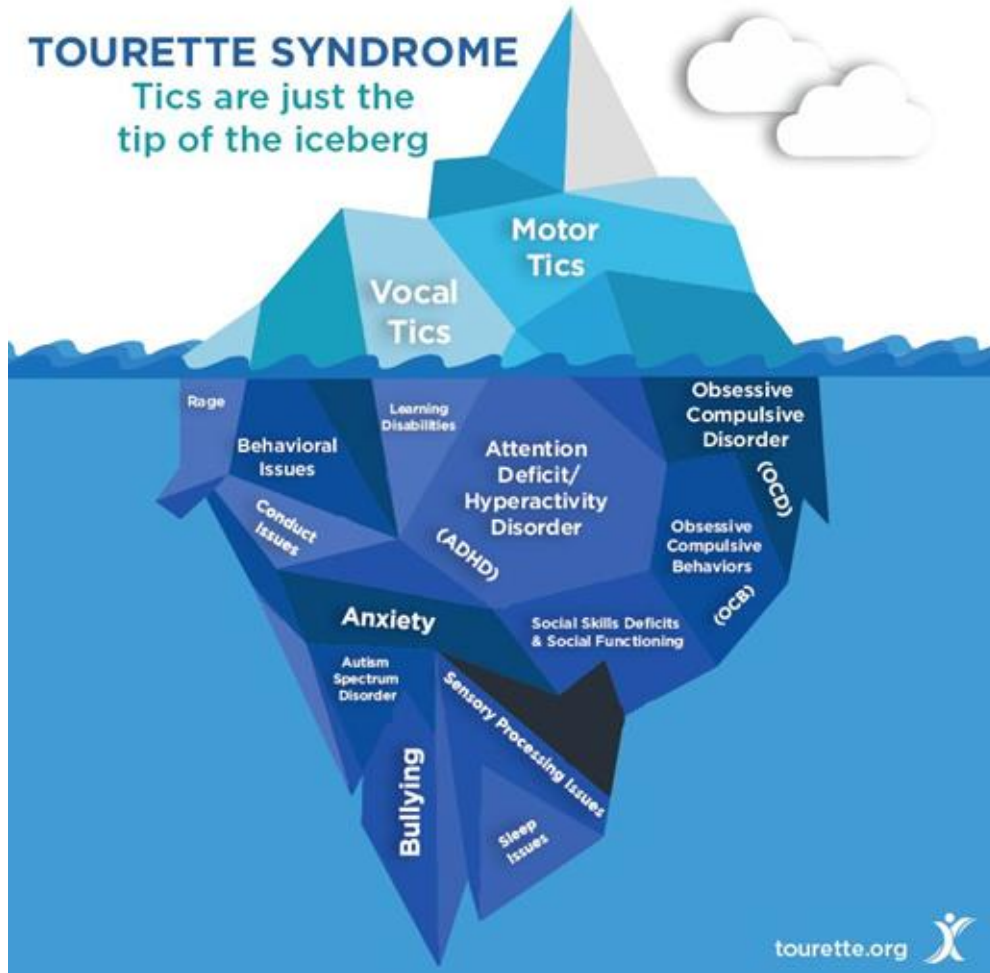
## Lifetime Prevalence, Age of Risk, and Etiology of Comorbid Psychiatric Disorders in Tourette Syndrome

Matthew E. Hirschtritt, M.D., M.P.H.<sup>1,\*</sup>, Paul C. Lee, M.D., M.P.H.<sup>2,\*</sup>, David L. Pauls, Ph.D.<sup>2</sup>, Yves Dion, M.D.<sup>3</sup>, Marco A. Grados, M.D.<sup>4</sup>, Cornelia Illmann, Ph.D.<sup>2</sup>, Robert A. King, M.D.<sup>5</sup>, Paul Sandor, M.D.<sup>6</sup>, William M. McMahon, M.D.<sup>7</sup>, Gholson J. Lyon, M.D., Ph.D.<sup>8</sup>, Danielle C. Cath, M.D., Ph.D.<sup>9,10</sup>, Roger Kurlan, M.D.<sup>11</sup>, Mary M. Robertson, M.B.Ch.B., M.D., D.Sc. (Med), F.R.C.P., F.R.C.P.C.H., F.R.C.Psych.<sup>12,13</sup>, Lisa Osiecki, B.A.<sup>2</sup>, Jeremiah M. Scharf, M.D., Ph.D.<sup>2,14,15,16,#</sup>, Carol A. Mathews, M.D.<sup>1,#</sup>, and for the Tourette Syndrome Association International Consortium for Genetics

- Largest and most comprehensive study of comorbidity in people with TS
- Cross-sectional structured diagnostic interviews, n=1374 with TS, mean age 19.1 years +/-13.5 and 1142 members of unaffected families, from tic disorder specialty clinics in the United States, Canada, Great Britain, and the Netherlands



# TS – a complex neuropsychiatric syndrome



86%



Had  $\geq 1$  neurodevelopmental or mental health comorbidities

58%



Had two comorbidities



# Objectives

- To discuss **the most common comorbid conditions** in people with TS.
- To review **the specificities** of the most common comorbidities in TS in diagnosis and management.



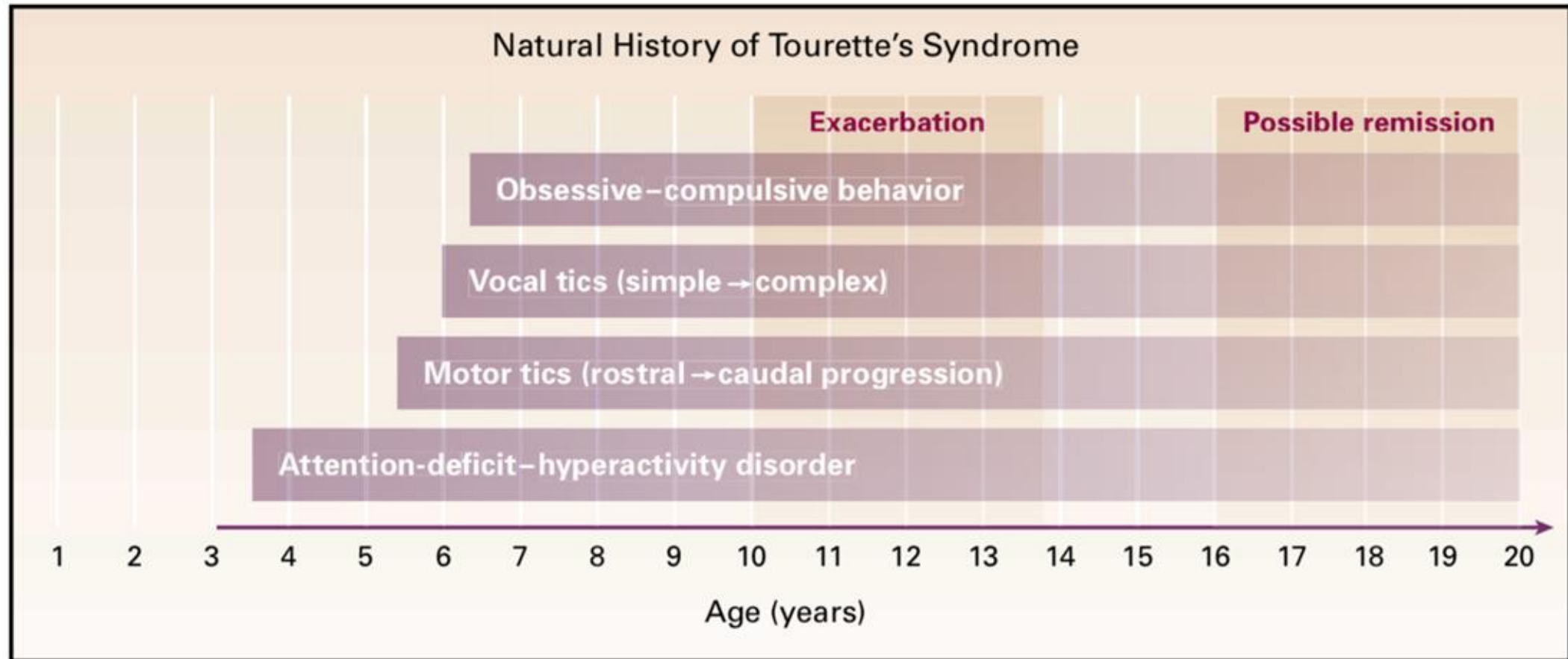


# Clinical comorbidities

- ADHD 30-60%
- OCD/OCB 30-40%
- Anxiety disorders 25%-30%
- Mood disorder 10-20%
- Conduct & ODD 10-30%
- ASD 5-10% (broader phenotype 20%)
- Specific learning difficulties 23%
- Dyspraxia 2-6%
- Injury
- Migraine/headaches
- Sleep disorders
- Stereotyped movements
- Teeth grinding/bruxism
- Trichotillomania, nail biting/skin picking
- Speech delay/stuttering



# Onset of comorbidities



# Quality of life in Tourette syndrome

- Lower quality of life than the general healthy population.<sup>1</sup>
- Associated psychiatric comorbidities, particularly ADHD and OCD, are often more disabling than tics.<sup>2</sup>
- In adults with TS, tic severity contributed little to quality of life.<sup>3</sup>

Screening and management of TS comorbidities are therefore crucial goals in this population.<sup>4</sup>



**Treat behavioral co-morbidities first if these are the main source of disability!!!**

<sup>1</sup>Storch et al., 2007; Jalenques et al., 2012 ; <sup>2</sup>Eddy et al., 2011; <sup>3</sup>Muller-Vahl et al., 2010 ;

<sup>4</sup>Pringsheim et al., 2009; Ganos and Martino, 2015



ADHD

# DSM 5 Criteria for ADHD

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Several inattentive or hyperactive-impulsive symptoms were present **before age 12 years**

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**Symptoms of inattention have been present for at least 6 months**, and they are inappropriate for developmental level

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**Symptoms of hyperactivity-impulsivity have been present for at least 6 months** to an extent that is disruptive and inappropriate for the person's developmental level

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Several symptoms are present in **two or more settings** (home, school or work).

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Interference with, or reduction of the **quality of, social, school, or work functioning.**

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# Six or more symptoms of **inattention** < 16, or five or more for 17+

- 
- Often does not seem to listen when spoken to directly.
  - Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace.
  - Often has trouble organizing tasks and activities.
  - Often loses things necessary for tasks and activities.
  - Is often easily distracted.
  - Is often forgetful in daily activities.



Six or more symptoms of **hyperactivity-impulsivity** <16, or five or more for 17+

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- Often **fidgets** with or taps hands or feet, or squirms in seat.
- Often **talks excessively**.
- Often **blurts out an answer** before a question has been completed.
- Often has **trouble waiting their turn**.
- Often **interrupts or intrudes** on others (e.g., butts into conversations or games)



# DSM 5 Criteria for ADHD

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**Combined Presentation:** if enough symptoms of both criteria inattention and hyperactivity-impulsivity were present for the past 6 months

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**Predominantly Inattentive Presentation:** if enough symptoms of inattention, but not hyperactivity-impulsivity, were present for the past six months

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**Predominantly Hyperactive-Impulsive Presentation:** if enough symptoms of hyperactivity-impulsivity, but not inattention, were present for the past six months.



# ADHD: most common comorbidity in TS

- 
- **Onset:** 3-5 years.<sup>1</sup>
  - Lifetime diagnosis: **54%**.<sup>2</sup>
  - **May improve** in adolescence.<sup>3</sup>
  - **In adults:** 26% in women, 21% in men.<sup>4</sup>
    - Difficulties with executive functions in daily life and relating to peers.
    - Continue to require support.<sup>5</sup>



<sup>1</sup>Martino et al., 2017, <sup>2</sup>Hirschtritt et al., 2015, <sup>3</sup>Groth et al., 2017, <sup>4</sup>Lewin et al., 2012, <sup>5</sup>Groth et al., 2017



# TS and ADHD: shared symptomatology

- Attentional problems
  - Increased attentional focus on internal **sensory 'tic' information** may contribute to reduced resources available for external attention tasks
  - Engaging in **tic suppression**
  - **Compulsions** or mental rituals/obsessional thoughts
- Impairment in control
- Hyperactivity
- Anxiety, depression
- Behaviour problems
- Sensory processing issues
- Sleep disturbances
- Impairment in socialization and communication
- Repetitive patterns of behaviour



# Underdiagnosis of girls?

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- **Males > females** (59% vs 42%;  $P < 0.01$ )<sup>1,2</sup>
- Higher M/F ratios in clinical versus population-based samples.
- Similar severity.<sup>3</sup>
- Inattentive presentation: females > males.<sup>3</sup>

**Externalising behavioural problems were predictors of diagnosis and treatment in females,** whereas males may be prescribed medication based on ADHD diagnostic status alone.<sup>3</sup>



<sup>1</sup>Hirschtritt et al., 2015 ; <sup>2</sup>Girgis et al., 2022, <sup>3</sup>Mowlem et al., 2019 (Parents of 19,804 twins (50.64% male) from the Swedish population completed dimensional assessments of ADHD symptoms)



# How does the co-occurrence of ADHD impact children with TS?

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- Children with ADHD+TS seem to be treated for TS symptoms earlier, without having greater tic severity (greater overall psychosocial impairment?)
- Co-occurring ADHD may impair tic suppression
- Mental effort to suppress tics may accentuate inattention in ADHD
- Moderation of the effectiveness of alpha agonists for the treatment of tics ?
- **Risk for aggressive and delinquent behaviour and conduct difficulties**



# Managing ADHD with tics

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## Alpha agonists

- Showed efficacy against tics, ADHD and oppositional behavior
- But moderate effect size and long latency of effect

## Stimulants

**Exacerbation of tics?**



# Stimulants do NOT appear to worsen tics

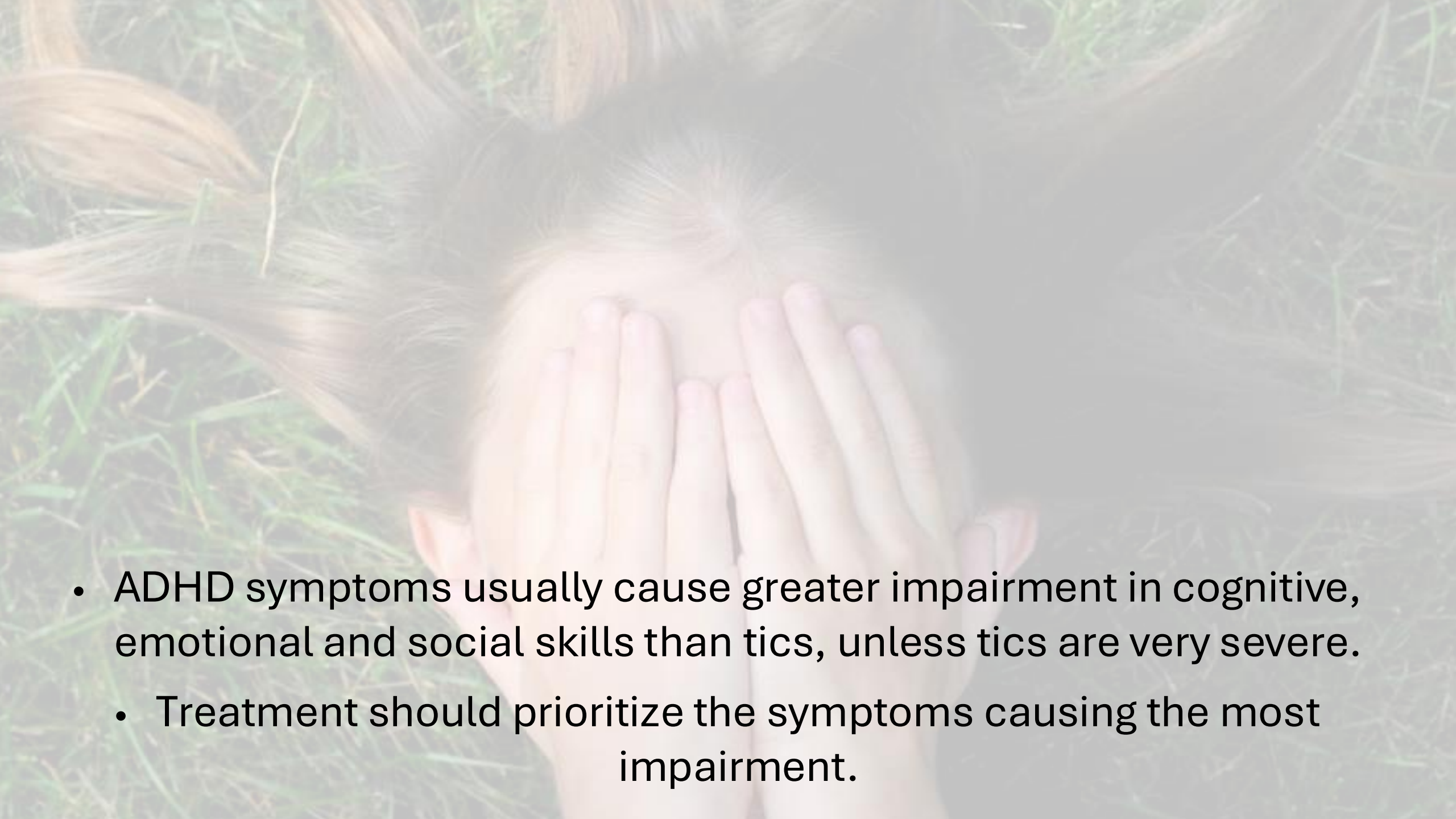
No increased risk of new onset tics, or tic worsening with stimulant medication compared to placebo.

However, despite there being no overall group effect of stimulants on tics, clinical reports indicate that tics **may be exacerbated in certain individuals** (about 20%), at higher stimulant doses, with tic worsening reversible by dose reduction (in 2 to 3 weeks)

- Comorbid ASD: more likely to have the sustained tic worsening
- **Improvement** with methylphenidate in both ADHD and tic symptoms
- **Psychostimulants remain the first-line treatment for ADHD in patients with TS** (effect size ++).

Whittington et al 2016, Cohen et al., 2015; Pringsheim & Steeves, 2011, Castellanos, 1997  
Gadow et al., 2007, Catalá-López et al., 2017; Ganos et al., 2017



- 
- A top-down view of a person with long, light-brown hair lying on their back on a grassy surface. Their hands are pressed against their forehead, with fingers spread. The image is semi-transparent, allowing the text to be overlaid.
- ADHD symptoms usually cause greater impairment in cognitive, emotional and social skills than tics, unless tics are very severe.
  - Treatment should prioritize the symptoms causing the most impairment.

OCD/OCBs

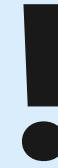
Other psychiatric  
comorbidities

# Anxiety disorders: 25-30%

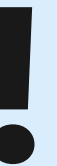
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- Women++<sup>1</sup>
- Associated with tic severity<sup>2,3</sup>
- Anxiety worsens tics
- Higher rates of tic-like attacks in this group
- Managing Parental/sibling anxiety – whole family / systemic approach

<sup>1</sup>Hirschtritt et al., 2015, <sup>2</sup>Coffey et al., 2000, <sup>3</sup>Johnco et al., 2016



Anxiety/a distressing event does not start a tic disorder but may make it noticeable for the first time.



# Depressive disorders: 30%

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- Variable associations with depression; significant issue in adolescents and adults with TS<sup>5</sup>
- Women++<sup>1</sup>
- Associated with tic severity<sup>2,3</sup>
- **Increased risk of both dying by suicide (OR=4.4) and attempting suicide (OR=3.9)<sup>4</sup>**
  - This risk was reduced but remained substantial even after adjusting for psychiatric comorbidities.
  - Persistence of tics beyond young adulthood was a predictor of death by suicide.



<sup>1</sup>Lewin et al., 2012, <sup>2</sup>Rizzo et al., 2017, <sup>3</sup>Lewin et al., 2012,

<sup>4</sup>Fernández de la Cruz et al., 2017, <sup>5</sup>Chou et al., 2013



# Oppositional Defiant Disorder (11-54%)

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- Severe and persistent negative, defiant, hostile and oppositional behaviour
- Conduct disorder: violation of the rights of others or societal norms
  - o Higher frequency **with age and in boys**
- Associated with ADHD



# DSM 5 Criteria for Autism spectrum disorder (1)

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## A. Persistent deficits in social communication and social interaction across multiple contexts:

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- 1) Deficits in social-emotional reciprocity.
  - 2) Deficits in nonverbal communicative behaviors used for social interaction
  - 3) Deficits in developing, maintaining, and understanding relationships
- 

## B. Restricted, repetitive patterns of behavior, interests, or activities, as manifested by at least two of the following:

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- 1) Insistence on sameness, inflexible adherence to routines, or ritualized patterns or verbal nonverbal behavior
- 2) Highly restricted, fixated interests that are abnormal in intensity or focus
- 3) Hyper- or hyporeactivity to sensory input or unusual interests in sensory aspects of the environment



## DSM 5 Criteria for Autism spectrum disorder (2)

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**C. Symptoms must be present in the early developmental period** (but may not become fully manifest until social demands exceed limited capacities or may be masked by learned strategies in later life).

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**D. Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.**

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**E. These disturbances are not better explained by intellectual disability (intellectual developmental disorder) or global developmental delay** (intellectual disability and ASD frequently co-occur)

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# ASD and TS (10-25%)

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## Overlap:

- **Stereotyped repetitive behaviors** that are aggravated or worsened by heightened emotional states (tics and stereotypies)
- Higher proportion of **males**
- Children with ASDs appear similar to children without ASDs with respect to **overall tic severity**

## Tools

- Social Responsiveness Scale (SRS)
- Social Communication Questionnaire (SCQ); Children's Communication Checklist.
- ADI-R (semi-structured interview) and/or ADOS (observation)

## Comorbidities

- Children with tic disorders + ASDs have greater overall rates of comorbidity (ADHD, rage attacks, ODD) compared with children with tics without ASDs

## Treatment

- Neuroleptics?



# Impulsive behaviour: rage/ explosive outbursts

Reported in 35% of children with TS  
and 8% of adults<sup>1</sup>

- Out of proportion to trigger
- Difficulty calming down
- Can persist in adolescence/adulthood
- Significantly associated with greater tic severity, & younger age of tic onset.<sup>2</sup>
- **More common when ADHD, OCD present.<sup>3</sup>**

<sup>1</sup>Bundman et al 2000; <sup>2</sup> Chen et al., 2013 ; <sup>3</sup>Mol Debes et al., 2008



# Trichotillomania (3-6%)

More common in TS-plus.  
Can be impairing.

- The hair pulling can be automatic as well as focussed
- Can be related to obsessive need to pull combined with impulsivity, tic-like for some, can be rewarding
- CBT/ ERP with Habit reversal can help
- Medication: mixed results but Clomipramine can help



# Substance use

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## Increased risk of any subsequent substance misuse outcomes

- alcohol-related disorder
- drug-related disorder
- substance-related death

(A Swedish cohort of 7832 individuals with a chronic tic disorder, mean age 13.4years, Virtanen et al., 2021).

The risk of different substance misuse outcomes in TS **remained significant after controlling for psychiatric comorbidity.**



Screening for drug/alcohol use should be part of the standard clinical routine, especially if comorbid ADHD



# Sleep disturbances: 25% in TS, maybe more?

Especially in the case of comorbid ADHD<sup>1</sup>

- The number of arousals from sleep: higher in children with ADHD ?

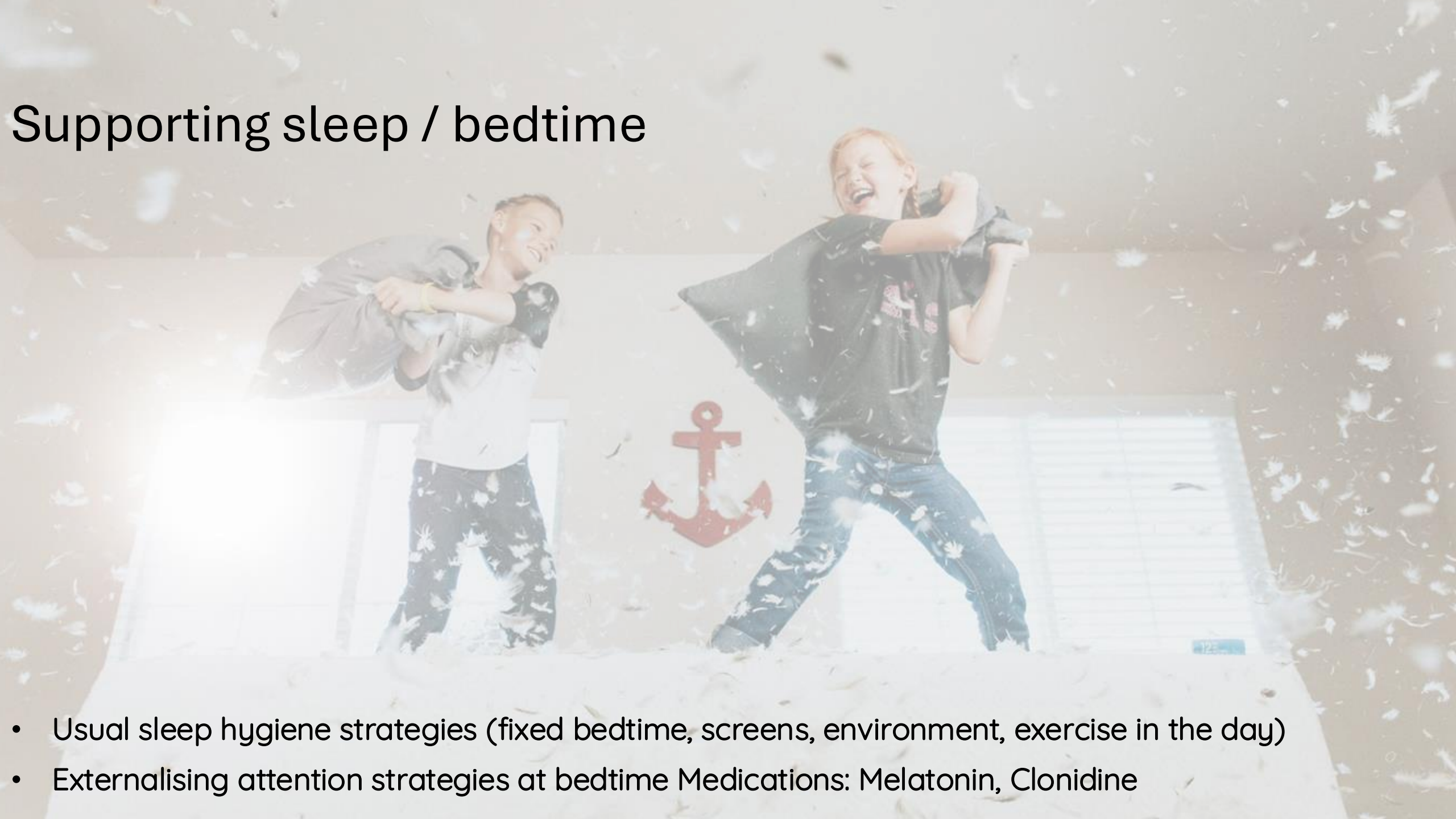
A study using a prospective questionnaire in 123 youth with TS reported a **65% prevalence of sleep disorders irrespective of comorbid ADHD.**<sup>2</sup>

## Factors affecting sleep:

- tic severity
- comorbid neurodevelopmental disorders
- medication use.



# Supporting sleep / bedtime



- Usual sleep hygiene strategies (fixed bedtime, screens, environment, exercise in the day)
- Externalising attention strategies at bedtime Medications: Melatonin, Clonidine

# Pain

**Table 1: Classification of Pain in Relation to Tic Disorders**

**1. Pain Caused by Tics or Compulsions**

**A) Exertional**

- i) Muscular pain due to excessive contraction
- ii) Skeletal or joint pain
- iii) Neuropathic pain (due to spinal cord, radicular or peripheral nerve compression)

**B) Traumatic**

- i) Pain in a body part struck by a moving limb
- ii) Pain in a moving body part striking something nearby
- iii) Self-mutilation (including biting)
- iv) Pain from compulsive touching of hot or sharp objects
- v) Pain inflicted on others from tics or compulsions

**2. Pain Caused by Suppression of Tics**

**3. Pain Relieving Tics**

- premonitory urge-related pain
- associated primary pain syndromes.

Riley and Lang, 1989, Green et al, 2025 (comprehensive review), Lavenstein et al, 2016

- Pain is reported by 47%–60% of individuals with TS
- Negatively impacts quality of life.
- Carpal tunnel syndrome, myelopathy



Review

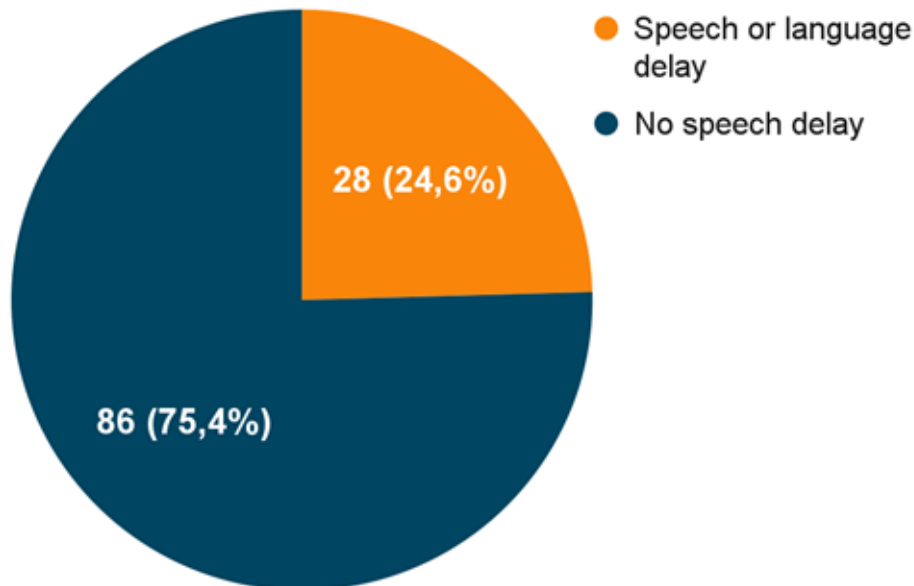
# Developmental stuttering, physical concomitants associated with stuttering, and Tourette syndrome: A scoping review

Christelle Nilles<sup>a</sup>, Lindsay Berg<sup>a</sup>, Cassidy Fleming<sup>b</sup>, Davide Martino<sup>c,d,e</sup>,  
Tamara Pringsheim<sup>a,c,d,e,\*</sup>



## Speech delay

Child Tic Disorder Registry, n=114 children



25/114 (22%) required speech therapy.

Speech or language delay :

- No association with severity of tics
- No association with comorbid ADHD.

Prevalence in the overall population:

- Speech delay: 3.8% (95% CI 2.9– 5.0%)

in 1,328 6-yo English-speaking children<sup>1</sup>

<sup>1</sup>Shriberg et al., 1999





# Developmental stuttering & Tourette

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## Prevalence

- **31%** stuttered or had stuttered (n=246 patients with TS vs controls,  $p < 0.0005$ )<sup>1</sup>
- **15%** diagnosed with DS (n=85 adults with TS)<sup>2</sup>
- **8%** exhibited stuttering (large multisite study)
- **15%** had been stuttering for > 6 months (n=314 children with TS)

## Similarities

- Frequent neurodevelopmental disorders, male predominance, comorbidities, waxing and waning course, good prognosis
- Preceded by an anticipatory sensation, +/- suppressible, response to neuroleptics and CBT.
- Polygenic disorders, dysfunction of the cortico-basal ganglia-thalamocortical loop.<sup>4</sup>





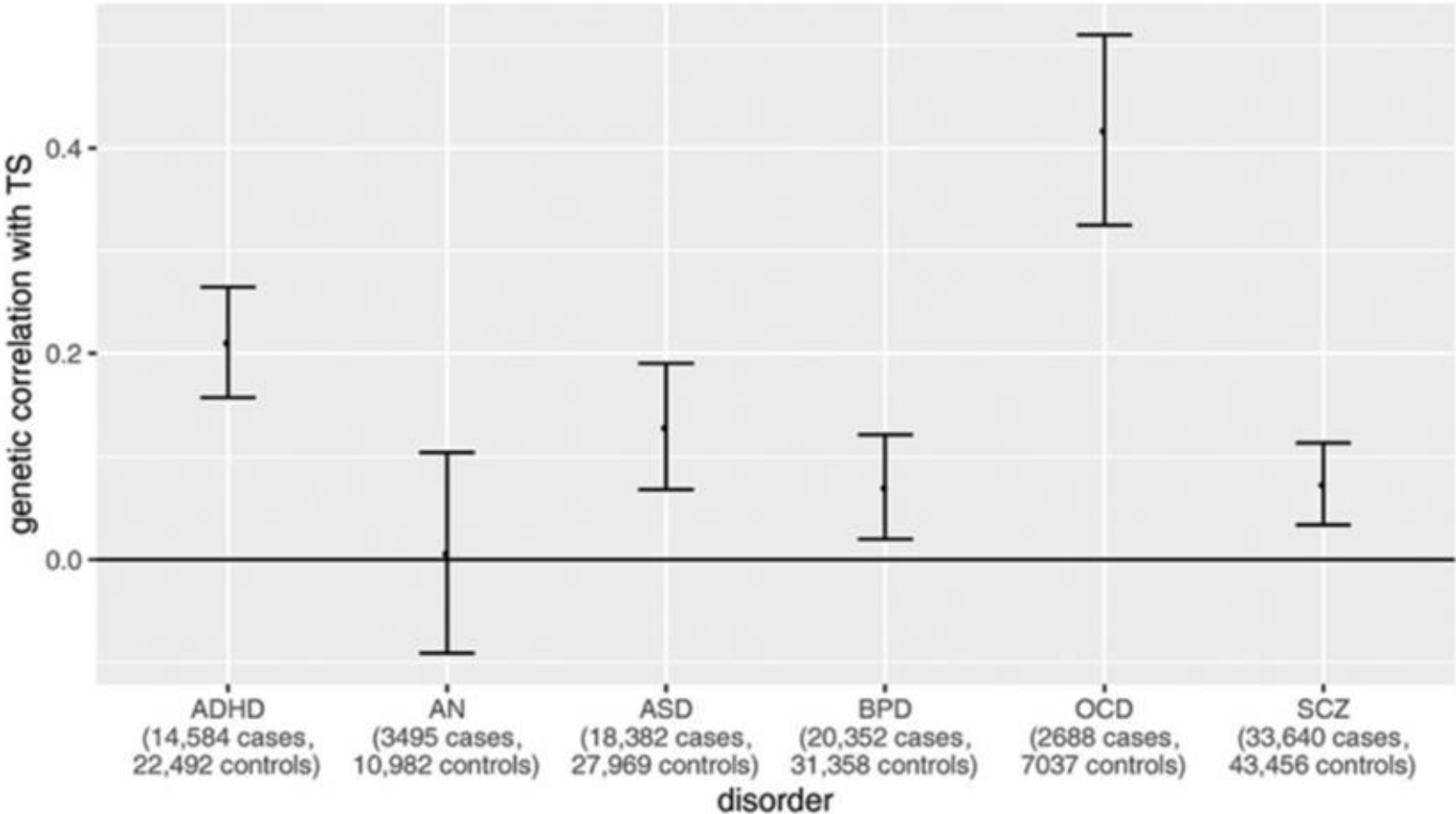
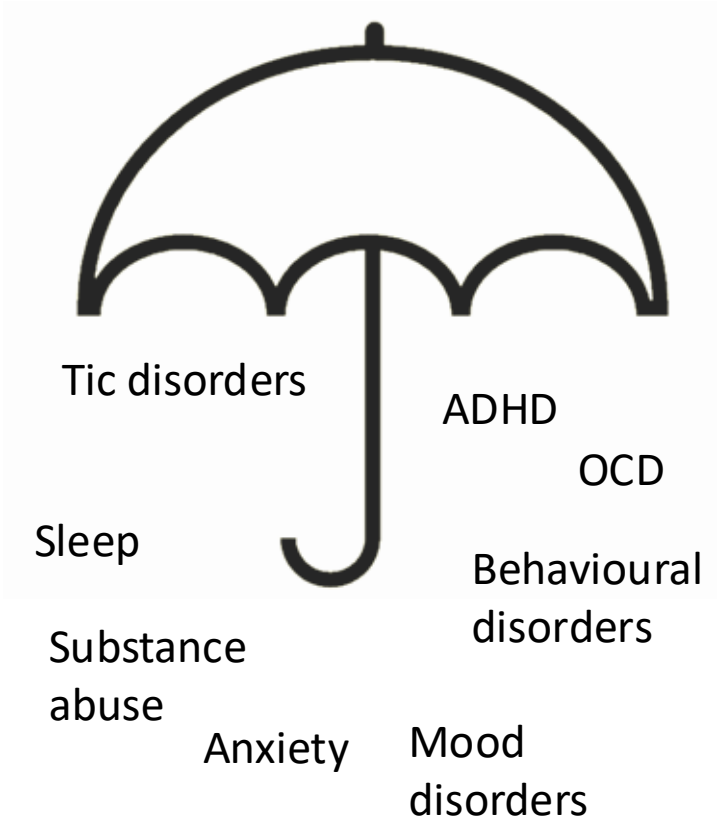
# Specific disfluency pattern in TS

- **Majority of typical disfluencies:** interjections, repetitions and revisions
- Cluttering behaviours
- **Complex phonic tics** (end of speech)
- Atypical disfluencies (but no prolongations and blocks)
- Speech or language delay
- Probably underdiagnosed -> not addressed specifically in speech therapy.
- Specific management?



# Why such an overlap of disorders?

## The neurodevelopmental umbrella



# Functional tic-like behaviours

Baking with Tourette's



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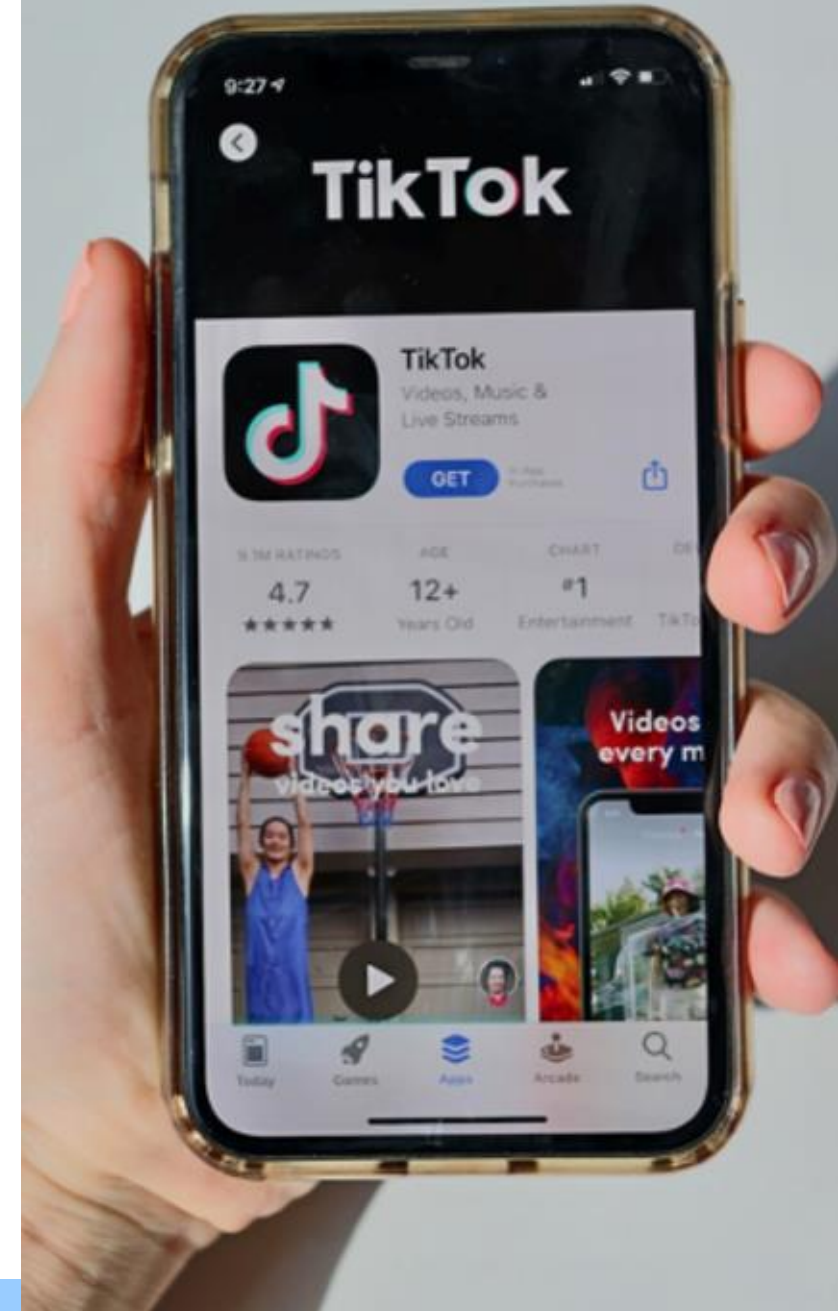
## Functional tic-like behaviours (FTLBs)

Movements or vocalizations that resemble tics.

*Unlike Tourette syndrome:*

- **Late** and **rapid** onset
- Large-amplitude arm movements, self-injurious behaviour, **coprophenomena**, bizarre words and phrases.
- **Complex tics** > simple tics
- May be influenced by popular references (**TikTok**).

Pringsheim et al., 2021; Müller-Vahl et al., 2021



# Comorbid functional tic-like behaviours in TS

Data from international Registry, 294 patients with FTLBs (97% adolescents/young adults, 87% females) (Martino et al, 2023)

**Around 20% of patients had pre-existing primary tic disorder**

Sample of 71 patients (38.0% female, mean age: 21.5y) with TS + FTLB. ([Müller-Vahl et al, 2024](#))

- Compared to a large TS sample, patients with TS + FTB were more likely to
  - be female
  - have coprophenomena-like symptoms
  - have atypical influential factors
  - have atypical descriptions of premonitory sensations
  - have higher rates of comorbid obsessive-compulsive disorder
  - have self-injurious behaviors.



In Adults

# The Calgary and Paris Adult Tic Registry

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Comorbidities, n (%)	N=218
<b>Anxiety</b>	<b>108 (49.5%)</b>
<b>ADHD</b>	<b>78 (35.8%)</b>
<b>Depression</b>	<b>75 (34.4%)</b>
<b>OCD</b>	<b>43 (19.7%)</b>
Schizophrenia	2 (0.9%)
Bipolar disorder	2 (0.9%)
Personality disorder	4 (1.8%)
Substance use disorder	6 (2.8%)
<b>None</b>	<b>46 (21.1%)</b>

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# Assessment of comorbidities

## Assessment

### 1. Demographics

(age, gender, ethnicity, education level, SES, marital status [parents or pts])

### 2. Tic evaluation

- **Yale global tic severity scale** (checklist + severity + overall impairment) – **PUTS**
- **Engage and listen to parents/partners**
- **Contextual factors**

### 3. Comorbidities

**OCD: [C]Y-BOCS** **ADHD: SNAP**  
**Anxiety/depression: SCARED – BDI/BAI**  
**Disruptive behaviors: DBRS**  
**Autism: ASSQ**

### 4. Areas of functioning

**Engage and listen to parents/partners** (academic and professional proficiency; hobbies and recreational interests; aspirations)  
**GTS-QoL**  
**Sleep diary** (if required)

- ADHD: Conners (parents and teachers)
- Anxiety: MASC



# In conclusion

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- Having mental health comorbidities is the rule, not the exception in Tourette syndrome
- Most common: ADHD and OCD in children
- Often more impairing than the tics
- Screening and multidisciplinary management is crucial

*On the beach*  
by Benjamin Edwards (age 11)



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# 18<sup>th</sup> International Conference on Tourette Syndrome & Tic Disorders

TS-school 2026 edition

