TOURETTE SYNDROME: FROM ONE PHENOTYPE TO MANY

Andrea E. Cavanna MD

Consultant in Behavioural Neurology, BSMHFT
Hon Senior Clinical Lecturer, University of Birmingham
Hon Senior Research Fellow, Institute of Neurology, University College London
• History
• Tics & tic-related symptoms
• Epidemiology
• Behavioural spectrum
• OCD
• ADHD
• Affective disorders
• Personality disorders
• Other conditions
• QOL issues
• Management
History of Tourette Syndrome

• Marquise de Dampierre (Itard 1825)

• Georges Gilles de la Tourette (1885)
  – “Study of a neurological condition characterised by motor incoordination accompanied by echolalia and coprolalia”

• Seignot (1961)
  - First treatment of TS with Haloperidol
GEORGES GILLES DE LA TOURETTE
THE MAN AND HIS TIMES

A.J. LEES
Consultant Neurologist, The National Hospital for Nervous Diseases, London.

DOI 10.1007/s00202-004-0113-3

Pioneers of movement disorders:
Georges Gilles de la Tourette

Mini Review

H. Krämer\textsuperscript{1} und C. Daniels\textsuperscript{2}

\textsuperscript{1}Speyer am Rhein, and
\textsuperscript{2}Department of Neurology, University of Kiel, Germany
PLATE 4. — Gilles de la Tourette (2nd from the left back row) with some of his colleagues at the Salpêtrière.

Gilles de la Tourette (2e à partir de la gauche au 2e rang) avec quelques collègues à la Salpêtrière.
L. Brouillet, *Une Leçon Clinique à la Salpêtrière* (1887)
PLATE 5. — The front page of « Le Pays Illustré » depicting the assault on Gilles de la Tourette.

La page de gauche du « Le Pays illustré » décrivant l’attentat contre Gilles de la Tourette.
## RÉSUMÉ ANALYTIQUE DE NEUPE

<table>
<thead>
<tr>
<th>1</th>
<th>Femme</th>
<th>58 ans,</th>
<th>Paris (12)</th>
<th>1921-1923</th>
<th>Débute</th>
<th>Symptômes</th>
<th>Observations</th>
<th>Bibliographie</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Homme</td>
<td>32 ans,</td>
<td>Numéro France</td>
<td>1923-1924</td>
<td>Débute</td>
<td>Symptômes</td>
<td>Observations</td>
<td>Bibliographie</td>
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<tr>
<td>3</td>
<td>Homme</td>
<td>45 ans,</td>
<td>Paris (12)</td>
<td>1924-1925</td>
<td>Débute</td>
<td>Symptômes</td>
<td>Observations</td>
<td>Bibliographie</td>
</tr>
<tr>
<td>4</td>
<td>Homme</td>
<td>39 ans,</td>
<td>Paris (12)</td>
<td>1925-1926</td>
<td>Débute</td>
<td>Symptômes</td>
<td>Observations</td>
<td>Bibliographie</td>
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<td>5</td>
<td>Homme</td>
<td>43 ans,</td>
<td>Paris (12)</td>
<td>1926-1927</td>
<td>Débute</td>
<td>Symptômes</td>
<td>Observations</td>
<td>Bibliographie</td>
</tr>
<tr>
<td>6</td>
<td>Homme</td>
<td>34 ans,</td>
<td>Paris (12)</td>
<td>1927-1928</td>
<td>Débute</td>
<td>Symptômes</td>
<td>Observations</td>
<td>Bibliographie</td>
</tr>
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</table>

### OBSERVATIONS INÉDITES

<table>
<thead>
<tr>
<th>ÂGE</th>
<th>SYMPTÔMES</th>
<th>OBSERVATIONS</th>
<th>BIBLIOGRAPHIE</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 ans, 3 mois,</td>
<td>Incontinence anormale, principalement de la face et du corps</td>
<td>Incontinence, à distance, par l'obsédé, p. 1104</td>
<td>P. Marie et Gilles de la Tourette (1885)</td>
</tr>
<tr>
<td>10 ans, 1 mois,</td>
<td>Incontinence anormale, principalement de la face et du corps</td>
<td>Incontinence, à distance, par l'obsédé, p. 1104</td>
<td>P. Marie et Gilles de la Tourette (1885)</td>
</tr>
</tbody>
</table>

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**Table summarizing the nine original cases of Gilles de la Tourette (1885).**
The Behavioral Spectrum of Gilles De La Tourette Syndrome

Andrea Eugenio Cavanna, M.D.
Serena Servo,
Francesco Monaco,
Mary May Robertson

Famous People with Tourette Syndrome

**Tim Howard (1979 - )**

Tim Howard, a native of New Jersey, is the goalkeeper for the internationally renowned British soccer team, Manchester United, and was formerly goalkeeper of the New York/New Jersey MetroStars of Major League Soccer. Howard was diagnosed with Tourette Syndrome (TS) at the age of 10, but from early on he refused to let the disorder stand in the way of achieving his goals and aspirations. Howard has taken the approach that TS is not a problem — it is a part of life that ultimately makes you stronger. His motto on TS is “never let it be a stop sign, it’s just a speed bump — another obstacle to overcome.” Howard has clearly not allowed his TS to stop him; in only his first season with Manchester United, Tim Howard was voted best goalkeeper in the Premier League. Howard’s success has been an inspiration to thousands of children and his accomplishments have provided these children with the ability to view themselves as productive and valuable members of society. Howard hopes one day to establish his own foundation to raise public awareness about TS.

**Samuel Johnson (1709 - 1784)**

Samuel Johnson was a renowned writer, poet, and lexicographer who wrote the Dictionary of the English Language and The Lives of Poets. Many of Johnson’s peers observed his tic-like movements and compulsive tendencies and described his behavior in great detail. Johnson reportedly made repeated noises and blew to make whistling sounds. Hence, there is little question that Johnson had TS and possibly obsessive-compulsive disorder (OCD).

**Wolfgang Amadeus Mozart (1756-1791)**

It has been speculated that the renowned composer and musician, Wolfgang Amadeus Mozart, had Tourette Syndrome (TS). It is documented that Mozart wrote letters to his cousin, Maria, that contained many inappropriate words. In addition, Mozart was found to be hyperactive and to have mood swings, tics, and a love of made-up words. However, despite these behaviors, we will probably never know for certain whether Mozart had TS.
Tim Howard
In the intervals of articulating he made various sounds with his mouth, sometimes as if ruminating, or what is called chewing the cud, sometimes giving a half whistle, sometimes making his tongue play backwards from the roof of his mouth, as if clucking like a hen...

James Boswell
Weeding Mozart's medical history

L. R. Karhausen MD

Mozart’s scatological disorder

Benjamin Simkin

TABLE I—Distribution of scatological letters in the Mozart family’s correspondence

<table>
<thead>
<tr>
<th>Name</th>
<th>No of letters</th>
<th>No (%) scatological</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wolfgang Amadeus Mozart</td>
<td>371</td>
<td>39 (10-5)</td>
</tr>
<tr>
<td>Maria Anna Mozart (mother)</td>
<td>40</td>
<td>1 (2-5)</td>
</tr>
<tr>
<td>Nannerl Mozart (sister)</td>
<td>15</td>
<td>1 (6-7)</td>
</tr>
<tr>
<td>Leopold Mozart (father)</td>
<td>319</td>
<td>1 (9-3)</td>
</tr>
</tbody>
</table>

TABLE II—Features suggestive of Tourette’s syndrome in Wolfgang Amadeus Mozart’s letters. Figures are numbers (percentages)

<table>
<thead>
<tr>
<th>Feature</th>
<th>No (%) of letters (n=371)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features suggesting Tourette’s syndrome</td>
<td>63 (17-0)</td>
</tr>
<tr>
<td>Buttocks and defecation</td>
<td>45 (12-1)</td>
</tr>
<tr>
<td>Scatology</td>
<td>39 (10-5)</td>
</tr>
<tr>
<td>Shit</td>
<td>21</td>
</tr>
<tr>
<td>Arse</td>
<td>19</td>
</tr>
<tr>
<td>Muck</td>
<td>7</td>
</tr>
<tr>
<td>Fiddle or piss</td>
<td>6</td>
</tr>
<tr>
<td>Fart</td>
<td>4</td>
</tr>
<tr>
<td>Arse holes</td>
<td>3</td>
</tr>
<tr>
<td>Fondling and kissing, sexual fetish</td>
<td>4</td>
</tr>
<tr>
<td>Palilalia, echolalia, or word games</td>
<td>23 (6-2)</td>
</tr>
</tbody>
</table>

BMJ 1992;305:1563-1567
- History
- Tics & tic-related symptoms
- Epidemiology
- Behavioural spectrum
- OCD
- ADHD
- Affective disorders
- Personality disorders
- Other conditions
- QOL issues
- Management
TICS

“involuntary, sudden, rapid, recurrent, nonrhythmic, stereotyped movements or vocalizations”

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onset</strong></td>
<td>By age 21 years</td>
</tr>
<tr>
<td><strong>Motor tics</strong></td>
<td>Multiple</td>
</tr>
<tr>
<td><strong>Vocal tics</strong></td>
<td>At least one</td>
</tr>
<tr>
<td><strong>Course</strong></td>
<td>Gradual; wax and wane</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>More than 1 year</td>
</tr>
<tr>
<td><strong>Tic-free intervals</strong></td>
<td>..</td>
</tr>
<tr>
<td><strong>Drugs</strong></td>
<td>Not due to use of tic-provoking substances—substances (eg, stimulants)</td>
</tr>
<tr>
<td><strong>Medical disorders</strong></td>
<td>Not associated with other disorders (eg, Huntington’s chorea, postviral encephalitis)</td>
</tr>
<tr>
<td><strong>Witnessed</strong></td>
<td>Tics observed by a knowledgeable individual</td>
</tr>
</tbody>
</table>
Tourette Syndrome = a chronic tic disorder

Other tic disorders include:

1. **Chronic motor OR vocal tic disorder (CTD)**
   - single or multiple motor OR vocal tics (but not both)
   - a year’s duration
   - onset before 18 years

2. **Transient tic disorder (TTD)**
   - single or multiple motor and/or vocal tics
   - last for at least 4 weeks
   - NOT longer than 12 months
   - starting before 18 years
Sensory/Cognitive symptoms

• Premonitory sensation
• Relief after movement
• Movement suppressible
• Rebound after suppression
PHENOMENOLOGY OF TICS AND NATURAL HISTORY OF TIC DISORDERS

Density of Premonitory Urges (ever)
1. Right before I do a tic, I feel like my insides are itchy.
2. Right before I do a tic, I feel pressure inside my brain or body.
3. Right before I do a tic, I feel “wound up” or tense inside.
4. Right before I do a tic, I feel like something is not “just right.”
5. Right before I do a tic, I feel like something isn’t complete.

6. Right before I do a tic, I feel like there is energy in my body that needs to get out.
7. I have these feelings almost all the time before I do a tic.
8. These feelings happen for every tic I have.
9. After I do the tic, the itchiness, energy, pressure, tense feelings, or feelings that something isn’t “just right” or complete go away, at least for a little while.
10. I am able to stop my tics, even if only for a short period of time.
Other disorders presenting with tics

- Huntington’s disease (choreic movements)
- Wilson disease (dystonic postures)
- Acanthocytosis
- Hallervorden-Spatz
- X-chromosome disorders (including Lesch-Nyhan)
- Other chromosomal disorders
  - Down’s, tuberose sclerosis, NFT
- Post-encephalitis
- Drugs of abuse (eg. Cocaine)
- Traumatic brain injury, CVA
Natural history of TS

- Mean onset around 6 years
- Typically start simple and get more complex
- Phonic tics start at 8-15 years
- Worst between 12-14 years and then improve
  - Repertoire of tics gets more stable
  - Tic-free periods longer
- Rarely go away completely
- “Fractal” occurrence of tic symptoms
The fractal nature of tics

Leckman JF *The Lancet* 2002
Mean tic severity in TS (N=42)

Leckman JF et al. *Pediatrics* 1998
TABLE 1
A Review of the Most Common Tics

<table>
<thead>
<tr>
<th>Simple tics</th>
<th>Complex tics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phonic or vocal tics</strong></td>
<td><strong>Motor tics</strong></td>
</tr>
<tr>
<td>Throat clearing</td>
<td>Eye blinking</td>
</tr>
<tr>
<td>Sniffling</td>
<td>Sticking tongue out</td>
</tr>
<tr>
<td>Barking</td>
<td>Head turning</td>
</tr>
<tr>
<td>Coughing</td>
<td>Shoulder jacking</td>
</tr>
<tr>
<td>Yelling</td>
<td>Muscle tensing</td>
</tr>
<tr>
<td>Hiccuping</td>
<td>Kicking</td>
</tr>
<tr>
<td>Belching</td>
<td>Flexing fingers</td>
</tr>
<tr>
<td>Animal sounds</td>
<td>Kissing</td>
</tr>
</tbody>
</table>

**Phonic or vocal tics**
- Repeating parts of words or phrases
- Prosodic changes
- Talking to oneself (multiple characters)

**Assuming different intonations**
- Use of obscene words

**Motor tics**
- Flapping arms
- Facial grimacing
- Adjusting or picking at clothing
- Complex touching movements
- Jumping
- Shaking feet
- Pinching
- Poking
- Kissing self or others
- Spitting

---

**Recognition and Management of Tourette's Syndrome and Tic Disorders**

MOHAMMED M. BAGHERI, M.D., JACOB KERBESHIAN, M.D., and LARRY BURD, PH.D.
University of North Dakota School of Medicine and Health Sciences
Grand Forks, North Dakota

Bagheri MM, Kerbeshian J, Burd L. Am Fam Phys 1999;59:2263-72
Other features of Tourette Syndrome

Gilles de la Tourette (1885) - Triad

- tics
- coprolalia
- echolalia

Echolalia - Echopraxia

Palilalia - Palipraxia

Coprolalia (inappropriate, involuntary, swearing)

- 10-15% overall (Japan 4% --?)
- approximately 30% clinic patients
- onset = 15 years

Copropraxia
TABLE 3
Problems Associated with Tourette’s Syndrome and Percentage of Patients with These Problems

<table>
<thead>
<tr>
<th>Coprolalia (0 to 25%)</th>
<th>Compulsive behaviors (30 to 50%)</th>
<th>Obsessive thoughts (30%)</th>
<th>Coprophagia (1 to 6%)</th>
<th>Echophenomena (30 to 60%)</th>
<th>Behavior problems (60 to 80%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obscene words and statements</td>
<td>Precise arrangement of objects</td>
<td>Mental echolalia (words, phrases)</td>
<td>Obscene thoughts</td>
<td>Holding groin</td>
<td>Obscene gestures</td>
</tr>
<tr>
<td></td>
<td>Touching things</td>
<td></td>
<td>Counting or grouping</td>
<td>Obscene gestures</td>
<td>Touching others</td>
</tr>
<tr>
<td></td>
<td>Rechecking</td>
<td></td>
<td>Sexual thoughts</td>
<td>Placing head</td>
<td>Sexually</td>
</tr>
<tr>
<td></td>
<td>Smelling</td>
<td></td>
<td>Thinking about forbidden actions</td>
<td>on another’s breast</td>
<td>Echolalia (repeating</td>
</tr>
<tr>
<td></td>
<td>Licking</td>
<td></td>
<td>(standing on desk in school, kissing teacher, touching others sexually)</td>
<td>Picking at buttocks</td>
<td>others’ words or statements)</td>
</tr>
<tr>
<td></td>
<td>Frasing</td>
<td></td>
<td>Thinking about exposing oneself</td>
<td></td>
<td>Echophasia (imitating others’ actions)</td>
</tr>
<tr>
<td></td>
<td>Writing and rewriting of letters until perfect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washing hands repeatedly</td>
<td></td>
<td></td>
<td></td>
<td>Phallolalia (repeating one’s own statements, words or parts of words)</td>
</tr>
</tbody>
</table>

NOTE: This list is not exhaustive, since a wide range of symptoms may occur in patients with Tourette’s syndrome.
**NOSI** (Kurlan et al 1996)

1. NOSI common
2. One third social difficulties
3. Possibly motor and vocal tics
4. Closely associated with 
   - CD
   - ADHD
   } i.e. impulse control
5. Not related to OCB
Self injurious behaviour in TS
Gilles de la Tourette 1885

Nine cases
Two injured themselves
24 year old male - lacerated tongue
14 year old male - lower lip biting
Self-injury – NHNN London

Robertson et al 1989

90 GTS

31 SIB
- 18 Male
- 12 Female

23 types SIB
## Self-injury – NHNN London

Robertson et al 1989

<table>
<thead>
<tr>
<th>Hostility</th>
<th>HDHQ</th>
<th>Paranoid Hostility</th>
<th>0.01</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>HDHQ</td>
<td>Criticism of others</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>HDHQ</td>
<td>Sum of hostility</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>MACL</td>
<td>Hostility</td>
<td>0.005</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Obsessionality</th>
<th>Leyton</th>
<th>Symptom</th>
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<tr>
<td></td>
<td></td>
<td>Trait</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Self injurious behaviours - 1

Uneven focal shoe deterioration in Tourette syndrome

Andrea E Cavanna¹,²
Francesco Monaco¹
Marco Mula¹
Mary M Robertson²
Hugo D Critchley³

¹Department of Neurology, Amedeo Avogadro University, Novara, Italy;
²UCL Institute of Neurology, London, UK; ³Department of Psychiatry, Brighton and Sussex Medical School, Brighton, UK
Self injurious behaviours - 2

Cavanna et al J Pediatr Neurol 2009 in press
Short communication

Air swallowing as a tic

Rimona S. Weil\textsuperscript{a,*}, Andrea E. Cavanna\textsuperscript{a,b}, John M.T. Willoughby\textsuperscript{c}, Mary M. Robertson\textsuperscript{a,d}
• History
• Tics & tic-related symptoms
• **Epidemiology**
• Behavioural spectrum
• OCD
• ADHD
• Affective disorders
• Personality disorders
• Other conditions
• QOL issues
• Management
The causes of this syndrome have long been controversial. Now research is unearthing both genetic and environmental triggers and pointing the way to better treatments.

Making Sense of Tourette's

“When I’m asked how many people have it,” says John Walkup, a child and adolescent psychiatrist at Johns Hopkins University (JHU) School of Medicine in Baltimore, “my response is, ‘Have what: mild tics or a severe case?’” According to Lawrence Seabill, who studies neuropsychiatric disorders at the Yale Child Study Center, a plausible lower bound for the syndrome is 1 in 1000 people and a plausible upper bound is 1 in 100. But because many people who would meet the diagnostic criteria for Tourette syndrome never seek treatment, better estimates are elusive.
Diagnosing Tourette syndrome
Is it a common disorder?

Mary M. Robertson*

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University College London, 2nd Floor Wolfson Building, 48 Riding House Street, London W1N 8AA, UK

Received 19 December 2001; accepted 17 September 2002

Abstract

Objectives: The evaluate the prevalence of Tourette syndrome (TS). Methods: A review of the literature on TS was undertaken to examine the prevalence of TS in mainstream children as well as those in special education. Results: Recent studies have indicated that TS occurs in around 1% of youngsters in mainstream schools between the ages of 5 and 16 years. It is even more common in youngsters with special educational needs. Conclusions: TS is more common than was previously documented.

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Review articles

The prevalence and epidemiology of Gilles de la Tourette syndrome
Part 1: The epidemiological and prevalence studies

Mary M. Robertson*  

University College, London, United Kingdom; and St George's Hospital & Medical School, London, United Kingdom

The prevalence and epidemiology of Gilles de la Tourette syndrome
Part 2: Tentative explanations for differing prevalence figures in GTS, including the possible effects of psychopathology, aetiology, cultural differences, and differing phenotypes

Mary M. Robertson*

University College, London, United Kingdom; and St George's Hospital & Medical School, London, United Kingdom
Epidemiology

Initially prevalence of TS = rare (5/10,000)

Prevalence depends on:

- definition of TS
- type of ascertainment
- epidemiological methods used

TS for many years = psychogenic bizarre curiosity
Prevalence of TS

Two pilot studies
- Kurlan et al 1994
- Mason et al 1998

Ten large definitive studies
- Comings et al 1990
- Nomoto and Machiyama 1990
- Wong and Lau 1992
- Kadesjo and Gillberg 2000
- Hornsey et al 2001
- Kurlan et al 2001
- Khalifa and Von Knorring 2003
- Wang and Kuo 2003
- Lanzi et al 2004

Conclusion – prevalence = 0.4 % - 3.8 % - age 5 - 18 years
= 3989/420312 = 0.949% = 1%
Review articles

The prevalence and epidemiology of Gilles de la Tourette syndrome

Part 1: The epidemiological and prevalence studies

Prevalence of GTS in youngsters

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Country</th>
<th>Age (years)</th>
<th>Sample source</th>
<th>Sample size</th>
<th>No. GTS</th>
<th>E</th>
<th>Procedure</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Felser [52]</td>
<td>1994</td>
<td>South Africa: Afrikaans</td>
<td>8–18</td>
<td>Comm.</td>
<td>392</td>
<td>386</td>
<td>E</td>
<td>Q</td>
<td>0.96</td>
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<tr>
<td>Kurlan et al. [47]</td>
<td>1994</td>
<td>USA</td>
<td>7–14</td>
<td>Reg/M schools</td>
<td>35</td>
<td>3</td>
<td>A</td>
<td>Obs, IV</td>
<td>3.0</td>
</tr>
<tr>
<td>Mason et al. [48]</td>
<td>1998</td>
<td>UK</td>
<td>13–14</td>
<td>Reg/M schools</td>
<td>166</td>
<td>5</td>
<td>A</td>
<td>Self-report pupil Q, P's, T's Q Obs by psychologist</td>
<td>2.9</td>
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<td>Comings et al. [49]</td>
<td>1990</td>
<td>USA</td>
<td>7–14</td>
<td>Reg/M schools</td>
<td>3034</td>
<td>33</td>
<td>A</td>
<td>Classroom Obs, T and/or P IV</td>
<td>1.1</td>
</tr>
<tr>
<td>Nennoo and</td>
<td>1990</td>
<td>Japan</td>
<td>4–12</td>
<td>388=KG 830=schl</td>
<td>1218</td>
<td>3</td>
<td>A</td>
<td>P Q, Tel call</td>
<td>0.5</td>
</tr>
<tr>
<td>Machiyama [50]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wang and Lai [51]</td>
<td>1992</td>
<td>China (Hong Kong)</td>
<td>4–16</td>
<td>School</td>
<td>718</td>
<td>3</td>
<td>E</td>
<td>Multicomponent scale and probing questions</td>
<td>0.4</td>
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<td>Kadesjo and Gillberg [53]</td>
<td>2000</td>
<td>Sweden</td>
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<td>Birth cohort</td>
<td>435</td>
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<td>A</td>
<td>Clinical examination</td>
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<td>Hornsey et al. [54]</td>
<td>2001</td>
<td>UK</td>
<td>13–14</td>
<td>Reg/M Schools</td>
<td>918</td>
<td>11</td>
<td>A</td>
<td>Self-report, P’s Q, T’s Q 2 IVs NHIS, YGTS, SDQ, Psycho-path Qs</td>
<td>0.76–1.85</td>
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<td>8.5–17.5</td>
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<td>2003</td>
<td>Sweden</td>
<td>7–15</td>
<td>schl</td>
<td>4479</td>
<td>25</td>
<td>A</td>
<td>Tie screening, Tel IV, clinical exam</td>
<td>0.6</td>
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<tr>
<td>von Knorring [8,56]</td>
<td>2005</td>
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<tr>
<td>Wang and Kuo [57]</td>
<td>2003</td>
<td>Taiwan</td>
<td>6–12</td>
<td>Reg/M School</td>
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<td>A</td>
<td>Q, examination, YGTS IVs</td>
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<td>Lanzri et al. [38]</td>
<td>2004</td>
<td>Italy</td>
<td>6–11</td>
<td>schl</td>
<td>2547</td>
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<tr>
<td>Zhong et al. [61],</td>
<td>2004</td>
<td>PR China</td>
<td>7–16</td>
<td>School students</td>
<td>9742</td>
<td>42</td>
<td>A</td>
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<tr>
<td>Jin et al. [60],</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Stefanoff et al. [62]</td>
<td>2007</td>
<td>Poland</td>
<td>12–15</td>
<td>School students</td>
<td>1579</td>
<td>10</td>
<td>E</td>
<td>P and T IVs and children’s IVs</td>
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<tr>
<td>Total numbers</td>
<td></td>
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<td>420312</td>
<td>3989</td>
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<td>0.949±(1%)</td>
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<tr>
<td>Van Rensburg [63]</td>
<td>2002</td>
<td>South Africa: Xhosa</td>
<td>6–16</td>
<td></td>
<td>327473</td>
<td>1506</td>
<td>Q Classroom Obs, IVs</td>
<td>0.046</td>
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</tr>
</tbody>
</table>
Prevalence of tic disorders

Lapouse and Monk 1964
Achenbach 1978
Achenbach & Edelbrock 1979
Khalifa & Von Knorring 2003
Wang & Kuo 2003
Lanzi et al 2004
Zheng et al 2004
Hornsey et al 2001 = 18.7%
Snider et al 2002 = 24.4%
Gadow et al 2002 = 3006 - preschool = 22.3%
- elementary school = 7.8%
- adolescents = 3.4%
Linazasoro et al 2006 – 867 children: parents & teachers – 71(6.7%) = tics
Wenning et al 2005 = less in older 50-89 = <1% had tics

Prevalence – youngsters = 4% - 28%
= prevalence higher during the winter months
= males more = less as older
Review articles

The prevalence and epidemiology of Gilles de la Tourette syndrome
Part 1: The epidemiological and prevalence studies

Mary M. Robertson*

University College, London, United Kingdom; and St George's Hospital & Medical School, London, United Kingdom

Prevalence of tics in mainstream school populations, reporting consistent results

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Country</th>
<th>Age (years)</th>
<th>Sample size</th>
<th>Procedure</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nomoto and Machiyama [50]</td>
<td>1990</td>
<td>Japan</td>
<td>4–12</td>
<td>1218</td>
<td>P, Q, Tel call</td>
<td>16.2, 0.5</td>
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<tr>
<td>Horsey et al. [51]</td>
<td>2001</td>
<td>UK</td>
<td>13–14</td>
<td>918</td>
<td>Self-report, P's Q, T's Q, 2 IVs (NHBS)</td>
<td>18.7</td>
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<tr>
<td>Snider et al. [77]</td>
<td>2002</td>
<td>USA</td>
<td>3–14</td>
<td>553</td>
<td>Obs</td>
<td>3.2–9.6 (prevalence) 24.4 (frequency)</td>
</tr>
<tr>
<td>Gadow et al. [78]</td>
<td>2002</td>
<td>USA</td>
<td>Preschool</td>
<td>3006</td>
<td>Teacher's Rating Scale</td>
<td>22.3</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Elementary school</td>
<td></td>
<td></td>
<td>7.8</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Adolescents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khalifa and von Knoring [8,56]</td>
<td>2003</td>
<td>Sweden</td>
<td>7–15</td>
<td>4479</td>
<td>Tic screening, Tel IV, clinical examination</td>
<td>3.4</td>
</tr>
<tr>
<td>Wang and Koe [57]</td>
<td>2003</td>
<td>Taiwan</td>
<td>7–16</td>
<td>2000</td>
<td>Q, examination, YGTSS IVs</td>
<td>4.9</td>
</tr>
<tr>
<td>Zheng et al. [61], Jin et al. [59], Jin et al. [60]</td>
<td>2004</td>
<td>China</td>
<td>7–16</td>
<td>9742</td>
<td>Q, T Obs, IVs with doctors</td>
<td>104/10 000=4.1% TTD=4.4 CTD 44-4 TTD 3.4 CTD</td>
</tr>
<tr>
<td>Linazasoro et al. [79]</td>
<td>2006</td>
<td>Spain</td>
<td></td>
<td></td>
<td>Information (video, talks) to P and T, Ts and P, Q, direct Obs of children</td>
<td>71.867±P 50.867±T 57.867±Obs (6.5%)</td>
</tr>
<tr>
<td>Stefanoff et al. [62]</td>
<td>2007</td>
<td>Poland</td>
<td>12–15</td>
<td>1579</td>
<td>P and T IVs, and Children's IVs</td>
<td>9.9 (lifetime Prev) 6.7 (point Prev)</td>
</tr>
</tbody>
</table>
Epidemiology

Reasons for widely differing results:

Tics = probably multidimensional in nature

- intensity of symptoms (from mild to severe)

- frequency of symptoms (from rate to constant)

- variety of symptoms (single and/or multiple tic groups)

- complexity of tics (simple to highly complex)

- comorbid psychiatric disorders (from none to multiple: which in turn affect disability)
Epidemiology

Individuals in special educational settings

eg. Learning difficulties (mental retardation)
Kurlan et al 1994
Kurlan et al 2001
Eapen et al 1997

Autistic spectrum disorder

Baron-Cohen et al 1999

Higher prevalence of TS
Prevalence of TS in youngsters with autism
Baron-Cohen et al 1999

447 pupils from 9 schools screened
• day + residential
• 6 stage design - records, observation, interview
• mean age 11 years
• M : F = 5 : 1

Definite TS - 19 (4%)
Probable TS - 10 (2%)
Total (6%)

• mild (YGTSS = 28%; 4 - 63)
• 78% +ve family hx tics, OCB
• not related to severity of autism
Prevalence of “true” GTS

- described by Dr George Gilles de la Tourette in 1885

That is: multiple tics + coprolalia + echolalia

= unknown
= far less common

10% of 1% ??
- History
- Tics & tic-related symptoms
- Epidemiology
- Behavioural spectrum
- OCD
- ADHD
- Affective disorders
- Personality disorders
- Other conditions
- QOL issues
- Management
MY SYMPTOMS......

* Tic
* Compulsions and obsessions
* Depression
* Stabbing/eneumatic attacks
* Mixed emotions (especially unexplained anger)
* Neurotic personality

TICS:

What tics do I have?

* Flicking my head to sides
* Leaning my shoulders
* Twisting my eyes up/center or to side
* Pouting
* Wrinkling my brow
* Jaw snapping

How severe are these tics?

The severity of the tics vary at different times for different reasons, sometimes there is no reason for doing them at all, they just happen. My continuous tics are the tensing of my stomach and flaring my eyes. Sometimes these can be very strong and uncontrollable which can lead me to panic as I am out of control with what I am doing. Often times they are not so strong and I can control doing them to the extent that they are not visible to others. If I am having a strong bout of my tics, sometimes I feel that I am doing all the above but at the same time, when this happens I feel like I can't stop myself from doing it or I can delay myself for a few seconds to find an area in my own that I can put myself or others don't see. If the tics are quite rapid then I may only have them up to 15 times a day which is completely noticeable, I may only do the tics up to a stationary position but when the tics are strong and complete I can have up to 20 in a space of a few minutes or more. It is difficult to count since happening all the time. I sometimes only have one tic that may last a few days or months and then it eases, sometimes disappears at an extent, but always will have a quick flinch of my head or quickly flinch my stomach. The severity always follows my stomach tension if that is alone and that I have no control over. I begin with a low I know I'm doing it until I hear myself or feel them then I become aware of them. Very rarely when I was young did I have them to stop my bag when I was talking, but that won't for a very short amount of time. I was taught at night, I don't know if I do it in my sleep, I don't think I do, but I get up in the night. I soon realize it when this thing is doing.

How am I able to control or cover up my tics?

When I was younger all around the 3 years old. I remember twitching all the time because I kept having a sore neck, although I was not to stop twitching, I never bothered me too
INVITED REVIEW

Tourette syndrome, associated conditions and the complexities of treatment

Mary M. Robertson

Correspondence to: Professor Mary M. Robertson, Department of Psychiatry and Behavioural Sciences, University College London, 2nd Floor, Wolfson Building, 48 Riding House Street, London W1N 8AA, UK
E-mail: rejmnr@ucl.ac.uk
Medical Progress

Tourette’s Syndrome

Joseph Jankovic, M.D.
Medical Progress

Tourette’s Syndrome

Joseph Jankovic, M.D.

Natural History of Tourette’s Syndrome

- Exacerbation
  - Obsessive-compulsive behavior
  - Vocal tics (simple→complex)
  - Motor tics (rostral→caudal progression)
  - Attention-deficit–hyperactivity disorder

Possible remission

Age (years)
Tourette’s syndrome

Lancet 2002; 360: 1577–86
The Behavioral Spectrum of Gilles De La Tourette Syndrome

Andrea Eugenio Cavanna, M.D.
Serena Servo,
Francesco Monaco,
Mary May Robertson

<table>
<thead>
<tr>
<th>TABLE 2. Main Clinical Features of Chronic Tic Disorder, Pure Tourette’s Syndrome, Full-Blown Tourette’s Syndrome, and Tourette’s Syndrome-Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic tic disorder</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Motor tics</td>
</tr>
<tr>
<td>Vocal tic(s)</td>
</tr>
<tr>
<td>Echophenomena</td>
</tr>
<tr>
<td>Paliphenomena</td>
</tr>
<tr>
<td>Coprophenomena</td>
</tr>
<tr>
<td>NOSI</td>
</tr>
<tr>
<td>Forced touching</td>
</tr>
<tr>
<td>Stuttering</td>
</tr>
<tr>
<td>Self-injurious behaviours</td>
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<tr>
<td>ADHD</td>
</tr>
<tr>
<td>OCD</td>
</tr>
<tr>
<td>Depression</td>
</tr>
<tr>
<td>Mood disorders</td>
</tr>
<tr>
<td>Personality disorders</td>
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</table>

NOSI = non-obscene socially inappropriate behaviours; ADHD = attention-deficit/hyperactivity disorder; OCD = obsessive-compulsive disorder
The Behavioral Spectrum of Gilles De La Tourette Syndrome

Andrea Eugenio Cavanna, M.D.
Serena Servo,
Francesco Monaco,
Mary May Robertson

FIGURE 2. The Neuropsychiatry of Tourette’s Syndrome

Tourette’s Syndrome-Plus

Full-Blown Tourette’s Syndrome

Pure Tourette’s Syndrome

Chronic Tic Disorders

The dimension of each area corresponds to the complexity of the clinical picture
Tourette Syndrome - Psychopathology

**Freeman et al 2000** - 3,500 individuals - 22 countries
Only 12% have no associated comorbidity (males more)
Most common morbidity is ADHD (60%)
Next comorbidity is OCB (32%)
Comorbidity associated with:
- anger control problems
- sleep difficulties
- coprolalia
- SIB

**Khalifa & Von Knorring 2005** community study
Only 8% no other diagnosis
As high as 36% had 3 or more other diagnoses
The Gilles de la Tourette Syndrome: a principal component factor analytic study of a large pedigree
Mary M. Robertson\textsuperscript{a} and Andrea E. Cavanna\textsuperscript{b,c}

<table>
<thead>
<tr>
<th>Symptom cluster</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frowning/raising eyebrows, sniffling/smelling</td>
<td>0.771</td>
<td>0.200</td>
<td>0.477</td>
</tr>
<tr>
<td>Eye blinking/winking, head/neck jerks, nasal twitches, mouthflips</td>
<td>0.735</td>
<td>0.103</td>
<td>0.392</td>
</tr>
<tr>
<td>movements, shoulder shrug</td>
<td>0.657</td>
<td>0.045</td>
<td>0.193</td>
</tr>
<tr>
<td>Eye rolling/staring, grunting/throat clearing/coughing</td>
<td>0.652</td>
<td>0.045</td>
<td>0.128</td>
</tr>
<tr>
<td>Vocalizations, echophenomena</td>
<td>0.448</td>
<td>-0.077</td>
<td>0.345</td>
</tr>
<tr>
<td>Touching of objects</td>
<td>0.482</td>
<td>0.122</td>
<td>-0.114</td>
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<tr>
<td>Substance abuse</td>
<td>0.231</td>
<td>0.787</td>
<td>0.080</td>
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<tr>
<td>Hyperactivity, inattention</td>
<td>0.075</td>
<td>0.724</td>
<td>0.372</td>
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<tr>
<td>Sleep disturbances</td>
<td>0.359</td>
<td>0.594</td>
<td>0.335</td>
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<tr>
<td>Aggressive behaviours</td>
<td>0.339</td>
<td>0.524</td>
<td>0.240</td>
</tr>
<tr>
<td>Licking/tongue movements, arm/hand/finger movements,</td>
<td>0.317</td>
<td>-0.402</td>
<td>0.080</td>
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<tr>
<td>leg/foot/toe movements, coprophagia, touching of body</td>
<td>-0.039</td>
<td>0.276</td>
<td>0.510</td>
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<tr>
<td>Palilphenomena</td>
<td>0.176</td>
<td>0.063</td>
<td>0.575</td>
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<td>Self-injury (including onychophagia)</td>
<td>0.094</td>
<td>0.235</td>
<td>0.496</td>
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<tr>
<td>Specific fears/phobias</td>
<td>0.329</td>
<td>0.128</td>
<td>0.487</td>
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<tr>
<td>Counting, evening up</td>
<td>0.114</td>
<td>-0.461</td>
<td>0.069</td>
</tr>
<tr>
<td>Facial grimacing, abdominal contractions</td>
<td>0.113</td>
<td>0.292</td>
<td>0.018</td>
</tr>
<tr>
<td>Anxiety, depression, obsessive thoughts, checking, excessive tidiness,</td>
<td>0.239</td>
<td>-0.050</td>
<td>0.427</td>
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<tr>
<td>excessive cleanliness</td>
<td>22.89</td>
<td>10.79</td>
<td>0.20</td>
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</tbody>
</table>

Table 1: Oblique three-factor solution for 18 clusters of tics and tic-related symptoms in 69 family members.

Symptom loadings with coefficient absolute values $\geq 0.400$ are shown in bold.
Agglomerative hierarchical cluster analysis of 37 face and tic-related symptoms from 69 family members. Values indicate clustered symptoms. Symptom codes clustered if their dendrogramized cluster distance is less than a determined value (see Results for details). Vertical linkage between groups, with the convergence occurring before 90 on the cluster distance axis (where 0 = individual symptom; 100 = unitary cluster of all symptoms).
### Summary of Factors or clusters found in Tourette syndrome

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Country</th>
<th>Study type</th>
<th>Tics and/or psychopathology</th>
<th>GTS individuals studied</th>
<th>No. of pts</th>
<th>No. of factors</th>
<th>Type of factors</th>
</tr>
</thead>
</table>
| Alsobrook and Pauls [80]    | 2002 | USA     | PCFA       | Both                        | GTS (USA)                       | 85        | 4 F           | 1. Agg  
2. Tics  
3. Comp  
4. Tapping & absence of grunting |
| Storch et al. [82]          | 2004 | USA     | PCFA       | Both                        | GTS (USA)                       | 76        | 4 F           | 1. Agg  
2. ADHD  
3. OCD  
4. Tic |
| Mathews et al. [83]         | 2006 | USA     | HCA        | Both                        | GTS, genetic isolates           | 254       | 2 C           | 1. Simple tics  
2. Complex tics + OCS |
| Robertson and Cavanna [84]  | 2007 | UK      | PCFA       | Both                        | A large multiply affected GTS pedigree | 69        | 3 F           | Tic  
Addhd and agg  
A/D/observation and SIB  
1. Soc ln and CVT  
2. Compl MT  
3. Sim tics  
4. Compulsive  
5. Touching slf  
1 Obs  
2 A/D |
| Robertson et al. [85]       | 2008 | UK      | HCA and PCFA | Both                       | GTS, clinic cohort               | 410       | 5 F           | |
| Eapen et al. [81]           | 2004 | UK      | PCFA       | Psychopathology only        | GTS, UK                         | 91        | 2 F           | |

*PCFA = Principal Component Factor Analysis, HCA = Hierarchical Cluster Analysis*
Summary

Tic symptom profiles in Tourette Syndrome

- Hierarchical Cluster Analysis
- Principal Component Factor Analysis
- Latent Class Analysis

TS is NOT a unitary condition

Phenotype dependent on multiple factors

Implications for DSM/ICD classification systems..?
• History
• Tics & tic-related symptoms
• Epidemiology
• Behavioural spectrum
• OCD
• ADHD
• Affective disorders
• Personality disorders
• Other conditions
• QOL issues
• Management
The causes of this syndrome have long been controversial. Now research is unearthing both genetic and environmental triggers and pointing the way to better treatments.

Making Sense of Tourette’s

Olson S. Making sense of Tourette’s. Science 2004;305:1390-1392
“He had another peculiarity [...] This was his anxious care to go out or in a door or passage, by a certain number of steps from a certain point, or at least so as that either his right or his left foot (I am not certain which), should constantly make the first actual movement when he came close to the door or passage.”

James Boswell
Obsessive–Compulsive Disorder in Tourette’s Syndrome

Peter G. Como, Jennifer LaMarsh, and Katherine A. O’Brien

“Current opinion holds that TS is a common neurobehavioral disorder with a heterogeneous clinical presentation”

Como PG, LaMarsh J, O’Brien KA.
# TS and OCD

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelman</td>
<td>1965</td>
<td>11%</td>
</tr>
<tr>
<td>Corbett et al</td>
<td>1969</td>
<td>13%</td>
</tr>
<tr>
<td>Fernando</td>
<td>1967</td>
<td>31%</td>
</tr>
<tr>
<td>Comins &amp; Comings</td>
<td>1985</td>
<td>32%</td>
</tr>
<tr>
<td>Abuzzahab &amp; Anderson</td>
<td>1973</td>
<td>33%</td>
</tr>
<tr>
<td>Asam</td>
<td>1982</td>
<td>38%</td>
</tr>
<tr>
<td>Hagin et al</td>
<td>1982</td>
<td>60%</td>
</tr>
<tr>
<td>Montgomery et al</td>
<td>1982</td>
<td>66%</td>
</tr>
<tr>
<td>Nee et al</td>
<td>1980</td>
<td>68%</td>
</tr>
<tr>
<td>Morphew &amp; Sim</td>
<td>1969</td>
<td>71%</td>
</tr>
<tr>
<td>Stefl</td>
<td>1984</td>
<td>74%</td>
</tr>
<tr>
<td>Yaryura - Tobias et al</td>
<td>1981</td>
<td>80%</td>
</tr>
</tbody>
</table>
TS and OCD – genetically related

Kurlan et al 1986
Robertson and Gourdie 1990
Walkup et al 1996
Pauls and Leckman 1986
Pauls et al 1986
Comings and Comings 1987
Pauls et al 1991
Eapen et al 1993
Obsessive Compulsive Symptoms in Gilles de la Tourette Syndrome and Obsessive Compulsive Disorder: Differences by Diagnosis and Family History

Valsamma Eappen,1 Mary M. Robertson,1 John P. Alsobrook II2 and David L. Pauls2*
1Department of Psychiatry, University of London, London, United Kingdom
2Child Study Center, Yale University School of Medicine, New Haven, Connecticut

TABLE V. Obsessive Compulsive Symptom Profile of “OCD” and “GTS” Clusters

<table>
<thead>
<tr>
<th>Obsession/compulsion</th>
<th>Fisher’s exact test P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>“OCD” cluster</strong></td>
<td></td>
</tr>
<tr>
<td>Concern for dirt/germs/contamination</td>
<td>0.000001</td>
</tr>
<tr>
<td>Need to tell/ask/know</td>
<td>0.01</td>
</tr>
<tr>
<td>Fear of something bad happening</td>
<td>0.05</td>
</tr>
<tr>
<td>Need to be neat and clean</td>
<td>0.001</td>
</tr>
<tr>
<td>Excessive washing</td>
<td>0.005</td>
</tr>
<tr>
<td>Excessive cleaning</td>
<td>0.005</td>
</tr>
<tr>
<td><strong>“GTS” cluster</strong></td>
<td></td>
</tr>
<tr>
<td>Fear of harming self/others</td>
<td>0.04</td>
</tr>
<tr>
<td>Violent/aggressive thoughts</td>
<td>0.04</td>
</tr>
<tr>
<td>Need for symmetry/evening up</td>
<td>0.05</td>
</tr>
<tr>
<td>Need for saying/doing things “just right”</td>
<td>0.007</td>
</tr>
<tr>
<td>Forced touching</td>
<td>0.02</td>
</tr>
</tbody>
</table>
Cath D et al
Gilles de la Tourette’s Syndrome with and without Obsessive-Compulsive Disorder compared with Obsessive-Compulsive Disorder without tics: which symptoms discriminate?
J Nerv Ment Dis 2001;189:219-228
The Disaster was my Fault!

MARY M. ROBERTSON¹ and ANDREA E. CAVANNA²
• History
• Tics & tic-related symptoms
• Epidemiology
• Behavioural spectrum
• OCD
• ADHD
• Affective disorders
• Personality disorders
• Other conditions
• QOL issues
• Management
Tourette Syndrome and ADHD

• Another talk...
• Increased co-morbidity in community samples
• Developmental disorders more common in boys
• Different time courses
  – TS has a later onset and quicker offset
• “A kind of disinhibition”
Prevalence of ADHD in TS - Epidemiological studies

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>ADHD prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caine et al</td>
<td>1988</td>
<td>27%</td>
</tr>
<tr>
<td>Apter et al</td>
<td>1993</td>
<td>8.3%</td>
</tr>
<tr>
<td>Robertson et al</td>
<td>1994</td>
<td>25%</td>
</tr>
<tr>
<td>Mason et al</td>
<td>1988</td>
<td>80%</td>
</tr>
<tr>
<td>Kadesjo &amp; Gillberg</td>
<td>2000</td>
<td>20%</td>
</tr>
</tbody>
</table>

20% - 80% Clinic populations
Current = 60% – eg. Freeman et al 2000
Genetics ADHD and Tourette Syndrome

Not genetically related - the majority view:
- Pauls et al 1986
- Eapen & Robertson 1996
- Stewart et al 2006

Genetically related:
- Comings Group
Spencer et al 1998

Pierre et al 1999

Carter et al 2000

Sukhodolsky et al 2003

Termine et al 2006

Rizzo et al 2007

**Children with TS+ADHD have:**

- More behaviour problems
- Poor social adaptations

Than children with
- TS alone
- neither diagnosis
Disentangling the effects of Tourette syndrome and attention deficit hyperactivity disorder on cognitive and behavioral phenotypes

Renata Rizzo a,*, Paolo Curatolo b, Mariangela Gulisano a, Marina Virzi a, Carla Arpino b, Mary M. Robertson a

Anger symptoms and “delinquent” behavior in Tourette syndrome with and without attention deficit hyperactivity disorder

Andrea Eugenio Cavanna a,b,*, Stefano Cavanna c, Francesco Monaco a
- History
- Tics & tic-related symptoms
- Epidemiology
- Behavioural spectrum
- OCD
- ADHD
- Affective disorders
- Personality disorders
- Other conditions
- QOL issues
- Management
Mood disorders and Gilles de la Tourette’s syndrome: an update on prevalence, etiology, comorbidity, clinical associations, and implications

Mary May Robertson*
Depression in Tourette Syndrome

- Robertson et al 1988: older more depressed
- Robertson et al 1993
- Robertson et al 1997: Controlled TS > depression
- Rickards and Robertson 2003: 
- Robertson et al 2006: tic severity, OC, ADHD
- Snijders Robertson Orth 2006 CD
Depression in TS

↑ Depression in TS clinic patients

Aetiology multifactorial

1. Chronic stigmatising disabling condition
2. Result bullying at school
3. Side effects of medication
4. Neurobiological substrates similar
5. Referral bias - Berkson 1946
6. Not Genetic

Correlates of Depression

Age, tic severity, OCD, ADHD, CD
• History
• Tics & tic-related symptoms
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• ADHD
• Affective disorders
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• Management
Personality Disorder and Psychopathology

Robertson et al 1997

39 GTS patients (31; 79% male); 29.6 yrs
34 controls (20; 59% male); 29.6 yrs

Yale Global Tic Severity Scale (Leckman et al 1989)
STCPD - screening test for co-morbid personality (Dowson 1992)

SCID-II

GTS: YGTSS 26.2 (range 11-55)
25/39 (64%) GTS = PD
2/34 (6%) Controls = PD  \{ p<0.0001
Possible explanations for increased personality disorder
Robertson et al 1997

1. Direct link between GTS & PD
2. Referral bias
3. GTS associated with childhood ADHD - which may in turn increase risk of adult PD
4. Chance
Schizotypal personality traits in Gilles de la Tourette syndrome


Objectives — Gilles de la Tourette syndrome (GTS) is a chronic tic disorder associated with comorbid psychopathology, including obsessiveness, affective instability and attention-deficit hyperactivity disorder. Evidence linking GTS with schizophrenia-like symptoms is limited and equivocal, despite a common putative substrate involving dopaminergic dysfunction within frontostriatal circuits. The aim of this study was to quantify the prevalence of schizotypal traits in GTS and to detail the relationship between schizotypy and comorbid psychopathology. Materials and methods — A total of 102 subjects with GTS were evaluated using the Schizotypal Personality Questionnaire and standardized neurological and psychiatric rating scales. The predictive interrelation between schizotypy, tic-related symptoms and psychiatric comorbidities was investigated using correlation and multiple regression analyses. Results — In our clinical population, 15% of the subjects were diagnosed with the schizotypal personality disorder according to the DSM-IV criteria. The strongest predictors of schizotypy were obsessiveness and anxiety ratings, and the presence of multiple psychiatric comorbidities correlated positively with schizotypy scores. Conclusions — Schizotypal traits are relatively common in patients with GTS, and reflect the presence of comorbid psychopathology, related to the anxiety spectrum. In particular, our preliminary results are consistent with a shared neurochemical substrate for the mechanisms underpinning tic expression, obsessiveness and specific schizotypal traits.

A. E. Cavanna1, M. M. Robertson2, H. D. Critchley2
1Sotten Department of Motor Neuroscience and Movement Disorders, UCL Institute of Neurology, London, UK and Department of Neurology, Amedeo Avezzano University of Ascoli Piceno, Italy; 2 UCL Institute of Neurology and Department of Mental Health Sciences, St. Georges Hospital Medical School, London, UK; 3Department of Psychiatry, Brighton and Sussex Medical School, Brighton, UK

Key words: Gilles de la Tourette syndrome; tic; schizotypy; obsessive-compulsive disorder

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Fax: +44 020 76126351
e-mail: a.cavanna@en.ucl.ac.uk

Accepted for publication April 2, 2007
RESULTS

Table 3  Comparison of SPQ scores in patients with uncomplicated GTS ('GTS only', n = 20) and patients with GTS and associated psychopathology ('GTS plus', n = 82)

<table>
<thead>
<tr>
<th>SPQ</th>
<th>GTS only (mean, SD)</th>
<th>GTS plus (mean, SD)</th>
<th>t</th>
<th>P</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>17.8 (6.3)</td>
<td>32.1 (14.3)</td>
<td>3.98</td>
<td>0.007**</td>
<td>4.37–20.14</td>
</tr>
<tr>
<td>CP</td>
<td>6.8 (4.5)</td>
<td>10.8 (4.8)</td>
<td>2.83</td>
<td>0.026*</td>
<td>1.74–9.72</td>
</tr>
<tr>
<td>I</td>
<td>9.1 (5.8)</td>
<td>10.5 (7.1)</td>
<td>4.35</td>
<td>0.003**</td>
<td>5.33–11.62</td>
</tr>
<tr>
<td>D</td>
<td>4.9 (3.2)</td>
<td>7.3 (4.7)</td>
<td>2.11</td>
<td>0.048*</td>
<td>0.02–4.37</td>
</tr>
</tbody>
</table>

GTS, Gilles de la Tourette syndrome; SPQ, Schizotypal Personality Questionnaire; CP, Cognitive-Perceptual dimension; I, Interpersonal dimension; D, Disorganized dimension. *P < 0.05; **P < 0.01.

Cavanna et al.

Figure 1. Total SPQ scores (y axis) by number of psychiatric comorbidities (x axis) in the GTS sample (n = 102).
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Gilles de la Tourette’s syndrome and its impact in the UK

J S Stern, S Burza, M M Robertson

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**Box 2: Suggested relationships between psychopathology and Tourette’s syndrome**

1. Generally accepted as an integral part of Tourette’s syndrome and genetically linked to the syndrome:
   - OCD/OCB.

2. Integral and related to OCB:
   - Self-injurious behaviours.

3. Common in Tourette’s syndrome and genetically linked in some cases:
   - ADHD.

4. Secondary to having Tourette’s syndrome:
   - Anxiety disorders.

5. Multifactorial:
   - Depression.

6. Adult psychopathology as a result of childhood comorbid psychopathology (ADHD, oppositional disorder, conduct disorder) rather than Tourette’s syndrome per se:
   - Personality disorder.

7. As a result of referral bias:
   - Conduct disorder.
   - Oppositional disorder.
   - Personality disorder.

8. Secondary to medication:
   - Dysphoria.
   - Anxiety (for example, separation anxiety).
   - Cognitive impairment.

9. Result of comorbidity with OCD and ADHD:
   - BPD.

10. More research needed:
    - Impulsivity, plus rage but not fulfilling criteria for ADHD.
    - Autistic spectrum disorder.

11. Rare and probably associated by chance:
    - Schizophrenia.

Modified from Robertson, 24, 25

---

- Pure GTS
- Full-blown GTS
coprophenomena
echophenomena
paliphenomena
- GTS-plus
## Psychopathology

<table>
<thead>
<tr>
<th>Authors</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shapiro et al</td>
<td>Nil specific</td>
</tr>
<tr>
<td>Comings et al</td>
<td>- conduct disorder</td>
</tr>
<tr>
<td></td>
<td>- dyslexia</td>
</tr>
<tr>
<td></td>
<td>- phobias, panic disorder</td>
</tr>
<tr>
<td></td>
<td>- manic depression</td>
</tr>
<tr>
<td></td>
<td>- schizoid behaviour</td>
</tr>
<tr>
<td></td>
<td>- alcoholism</td>
</tr>
<tr>
<td></td>
<td>- drug abuse</td>
</tr>
<tr>
<td></td>
<td>- gambling</td>
</tr>
<tr>
<td></td>
<td>- eating disorders</td>
</tr>
<tr>
<td>Most authorities</td>
<td>OCB/OCD &amp; ADHD</td>
</tr>
</tbody>
</table>
The Behavioral Spectrum of Gilles De La Tourette Syndrome

Andrea Eugenio Cavanna, M.D.
Serena Servo,
Francesco Monaco,
Mary May Robertson

<table>
<thead>
<tr>
<th>Neuropsychiatric disorder</th>
<th>Relationship with Tourette's syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD</td>
<td>Common in Tourette's syndrome and possibly genetically linked in some cases</td>
</tr>
<tr>
<td>OCD</td>
<td>Generally suggested as an integral part of and genetically related to GTS</td>
</tr>
<tr>
<td>Depression</td>
<td>Multifactorial/possibly due to comorbidity with OCD and ADHD, rather than to GTS per se</td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>Few cases described; probably due to related comorbidity</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>Uncommon, the association is by chance</td>
</tr>
<tr>
<td>Personality disorders</td>
<td>Relationship is unknown and more research is needed</td>
</tr>
</tbody>
</table>

Only 8-12% of GTS individuals in epidemiological and clinical settings have “pure” GTS with no other neuropsychiatric diagnosis [7, 21]

Adapted from Robertson MM, Cavanna AE: The neuropsychiatry and neuropsychology of Gilles de la Tourette syndrome, in Neuropsychological Assessment of Neuropsychiatric Disorders. Edited by Grant I, Adams KM. New York, Oxford University Press, 2007 in press
