FUNCTIONAL TIC-LIKE BEHAVIORS IN THE TIME OF COVID-19: THE METAMORPHOSIS OF AN ELUSIVE CREATURE

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OUTLINE

1. EARLY TIMES: QUESTIONS ARISEN FROM AN EARLY CASE
2. SHARING EXPERIENCES AROUND THE WORLD → ‘SPEAK THE SAME LANGUAGE’
3. ZOOMING IN ON THE TRIGGERS: PANDEMIC AND SOCIAL MEDIA
4. TOWARDS A UNIFIED MECHANISTIC MODEL
5. TOWARDS A UNIFIED TREATMENT: ‘THE LIGHT AT THE END OF THE TUNNEL’ → HOW MANY ‘VACCINES’?
LET’S RECAP: WHAT HAPPENED?

ER consultant → LATE SUMMER / EARLY FALL 2020 → Pediatrician → Specialist outpatient clinic
2020/2021

a ‘difficult year’

23, F

BACKGROUND

• Mild Tourette Syndrome since age 5 (shoulder shrugging, squinting, spitting, random words, few complex tics)
• ADHD diagnosis at age 12
• Depressive disorder since age 18

FAMILY HISTORY

• ASD and TS
2020/2021

a ‘difficult
year’

23, F

PRESENT ILLNESS

Started Oct 2020 with «tic attacks»

EMERGENCY ROOM
EXCESSIVE ATTENTION TOWARD INTERNAL SENSORY PHENOMENA

THE «VICIOUS CYCLE» OF TIC ATTACKS

Safety Behaviours
Plan route to student services, move to a safe position, hold wall

Interpretation of Sensations as Catastrophic

Body Sensations
Spine swollen, itchy, heart rate elevated, sweating, need the toilet, legs weaken

Perceived Threat
“I might have a tic attack” “what will others think?”

Anxiety/Apprehension
“Will it happen/won’t it happen?”

«RUMINATIVE» METACOGNITIVE PROCESSES

Trigger Stimulus
Premonitory urge: tingling in spine

INCREASED SELF-FOCUSED ATTENTION – HIGH LEVELS OF INTEROCEPTION

Internal Monitoring
Body scanning

[Robinson & Hedderly, Front Pediatr 2016]
«In our opinion, it is crucial that clinicians in casualties and acute settings recognize this phenomenon and have a diagnostic formulation and framework that leads to active management, with tic attacks conceptualized as reflecting an acute anxiety response in TS, rather than tics *per se* or non-epileptic seizures». 
2020/2021

a ‘difficult year’

23, F

MOTOR TIC-LIKE BEHAVIORS:
large number from the onset

• Lifting arm up & signing name / punching herself / hitting objects / clapping / kicking legs out / jumping

PHONIC TIC-LIKE BEHAVIORS:
large number from the onset

• Clicking / humming / purring / trilling tongue /// «wow», «knock-knock», coprolalia and echolalia

ANTECEDENTS AND POSSIBLE TRIGGERS

• “wave of energy” + anxiety prior to clusters of abnormal behaviors
• Following TikTok influencers regularly posting videos of tics
2020/2021: a ‘difficult’ year - 23, F

PSYCHIATRIC COMORBIDITIES on presentation

- ADHD diagnosis → confirmed by ADHD Adult Rating Scale
- DEPRESSION → Patient Health Questionnaire-9 (PHQ-9) scale = 20 on 27
- ANXIETY → Generalized Anxiety Disorder-7 (GAD-7) scale = 20 on 21
- OCB → large number of obsessive-compulsive behaviors

On presentation no active treatment for any of these problems
No other intercurrent neurological or medical problems
What are these? Differential diagnosis

1. Tics
2. Functional tic-like behaviors

Co-exist in approx. 25% of patients with Tourette syndrome

OUR PATIENT

[plus]
RAPID,
‘EXPLOSIVE’
ONSET

[Ganos, Martino...Edwards, Neurology 2019]
Risk factors: differences

[Image of Venn diagram showing categories of TS, overlap, and functional with various risk factors such as anxiety, obsessionality, low interoceptive accuracy, impulsivity/jumping to conclusions, traumatic precipitants, alexithymia, and life events.

[Ganos, Martino...Edwards, Neurology 2019]
Pathophysiology: differences

Cortico-striato-thalamo-cortical disinhibition
Increased sense of agency over voluntary movement

Reinforcement learning (conditioning/abnormal predictions)
Attentional effects (benefit of distraction, worsening with attention)

Enhanced limbic-motor connectivity
Reduced sense of agency over voluntary movement

[Ganos, Martino...Edwards, Neurology 2019]
Treatment: differences

- Antipsychotics
- A2-adrenergic agonists
- Botulinum toxin

CBT (awareness and habit-reversal training, exposure-response prevention, function-based interventions etc.)

Pharmacologic treatment of anxiety, depression etc.

Supportive psychotherapy

Motor retraining (establishment of normal movement patterns, etc.)

[ Ganos, Martino...Edwards, Neurology 2019 ]
ACUTE, EXPLOSIVE TIC-LIKE BEHAVIORS

**PANS**
- No age requirement
- Acute onset of OCD, tics, and/or restrictive eating behavior
- Can be triggered by any infectious trigger, sometimes even non-infectious triggers

**PANDAS**
- Age requirement: first episode occurs between 3 years old and puberty
- History of Group A Streptococcal infection
2020/2021

a ‘difficult year’

23, F

Summer 2021
HIGHLY DYNAMIC TIC-LIKE BEHAVIOUR REPERTOIRE

• NEW MOTOR BEHAVIOURS: facial grimacing, head movements, arm/hand/finger stretching, circling hand movements, «blocking», copropraxia (middle finger)

• NEW PHONIC UTTERANCES: lip smacking, laughing, «cuckoo» sound, new coprolalia
ESCALATING IMPACT OF TIC-LIKE BEHAVIOURS

- Self-injurious: «punching» tic → RH fracture; intense scratching until she bleeds
- Cannot attend to social events
- Profound impact on self-esteem, depression, irritability, insomnia and OCB
2020/2021

a ‘difficult year’

23, F

New psychiatric consultation → new diagnosis of borderline personality disorder

CONVERSION TO A BROADER FND PHENOTYPE

- Fixed ‘dystonic’ posturing: sustained right fist clenching; fixed plantar flexion of both feet → use of crutches and difficulty with stairs
- Associated severe pain in extremities
- PNES

DIAGNOSIS: RAPID ONSET FUNCTIONAL TIC-LIKE BEHAVIORS in patient with pre-existing TS
<table>
<thead>
<tr>
<th>Center</th>
<th>Pre-pandemic: estimated percentage of referrals for FTLBs as the primary problem</th>
<th>January–June 2021: estimated percentage of referrals with FTLBs as the primary problem</th>
<th>Pre-pandemic: average number of referrals received per year for tics/movement disorders</th>
<th>2020–2021: average number of referrals received per year for tics/movement disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calgary Alberta Children's Hospital Tourette Clinic</td>
<td>1–2</td>
<td>30</td>
<td>186</td>
<td>290</td>
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<tr>
<td>Sydney Children's Hospital at Westmead Tic Clinic</td>
<td>2–5</td>
<td>35</td>
<td>82</td>
<td>116</td>
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<tr>
<td>Tic and Neurodevelopmental Movements (TANDeM)</td>
<td>2</td>
<td>30</td>
<td>300</td>
<td>600</td>
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<tr>
<td>Evelina London Children's Hospital Guy's and St. Thomas' (GSTT) MD</td>
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<td></td>
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<tr>
<td>Cincinnati Children's Movement Disorders Clinic</td>
<td>1</td>
<td>20</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>UCLA Child OCD, Anxiety and Tic Disorders Program</td>
<td>2</td>
<td>20</td>
<td>92</td>
<td>71</td>
</tr>
</tbody>
</table>

Abbreviations: FTLBs, functional tic-like behaviors; OCD, obsessive-compulsive disorder.

[Pringsheim... Martino, *Mov Disord* 2021]
<table>
<thead>
<tr>
<th>History</th>
<th>TS</th>
<th>TLB</th>
<th>P-Value</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrupt symptom onset</td>
<td>0 (13)</td>
<td>12 (12)</td>
<td>&lt;0.001</td>
<td>1.00</td>
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<tr>
<td>First movement complex</td>
<td>0 (13)</td>
<td>7 (13)</td>
<td>0.083</td>
<td>0.58</td>
</tr>
<tr>
<td>Comorbidity with ADHD</td>
<td>2 (13)</td>
<td>1 (13)</td>
<td>1</td>
<td>0.00</td>
</tr>
<tr>
<td>Comorbidity with OCD</td>
<td>4 (13)</td>
<td>3 (13)</td>
<td>1</td>
<td>0.00</td>
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<tr>
<td>Comorbidity with ASD</td>
<td>0 (13)</td>
<td>1 (13)</td>
<td>1</td>
<td>0.00</td>
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<tr>
<td>Predominantly complex</td>
<td>0 (13)</td>
<td>12 (13)</td>
<td>&lt;0.001</td>
<td>0.92</td>
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<tr>
<td>Mostly slow and tonic</td>
<td>0 (13)</td>
<td>12 (13)</td>
<td>&lt;0.001</td>
<td>0.82</td>
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<tr>
<td>Only face/head/neck</td>
<td>3 (11)</td>
<td>0 (13)</td>
<td>0.978</td>
<td>0.36</td>
</tr>
<tr>
<td>Only trunk/extremities</td>
<td>0 (11)</td>
<td>2 (13)</td>
<td>1</td>
<td>0.19</td>
</tr>
<tr>
<td>Mostly trunk/extremities</td>
<td>0 (11)</td>
<td>10 (13)</td>
<td>0.003</td>
<td>0.77</td>
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<tr>
<td>Copropraxia</td>
<td>1 (13)</td>
<td>7 (13)</td>
<td>0.393</td>
<td>0.47</td>
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<tr>
<td>Echopraxia</td>
<td>0 (13)</td>
<td>5 (9)</td>
<td>0.082</td>
<td>0.63</td>
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<tr>
<td>Any vocalization</td>
<td>13 (13)</td>
<td>11 (13)</td>
<td>1</td>
<td>0.21</td>
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<tr>
<td>First vocalization a word</td>
<td>0 (13)</td>
<td>2 (11)</td>
<td>1</td>
<td>0.26</td>
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<tr>
<td>Any simple vocalization</td>
<td>13 (13)</td>
<td>9 (12)</td>
<td>1</td>
<td>0.33</td>
</tr>
<tr>
<td>Any complex vocalization</td>
<td>2 (13)</td>
<td>5 (12)</td>
<td>1</td>
<td>0.21</td>
</tr>
<tr>
<td>Mostly complex vocalizations</td>
<td>0 (13)</td>
<td>4 (10)</td>
<td>0.332</td>
<td>0.49</td>
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<tr>
<td>Coprolalia</td>
<td>1 (13)</td>
<td>5 (13)</td>
<td>1</td>
<td>0.31</td>
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<tr>
<td>Echolalia</td>
<td>0 (13)</td>
<td>5 (10)</td>
<td>0.112</td>
<td>0.58</td>
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<td>Premonitory sensations</td>
<td>12 (13)</td>
<td>10 (12)</td>
<td>1</td>
<td>0.00</td>
</tr>
<tr>
<td>Ability to suppress</td>
<td>11 (11)</td>
<td>5 (12)</td>
<td>0.082</td>
<td>0.61</td>
</tr>
<tr>
<td>Varied repertoire</td>
<td>0 (13)</td>
<td>13 (13)</td>
<td>&lt;0.001</td>
<td>1.00</td>
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<tr>
<td>Continue during examination</td>
<td>1 (10)</td>
<td>13 (13)</td>
<td>&lt;0.001</td>
<td>0.91</td>
</tr>
<tr>
<td>Increased with others</td>
<td>0 (8)</td>
<td>12 (12)</td>
<td>&lt;0.001</td>
<td>1.00</td>
</tr>
<tr>
<td>Worse when alone</td>
<td>8 (8)</td>
<td>0 (12)</td>
<td>&lt;0.001</td>
<td>1.00</td>
</tr>
<tr>
<td>Fluctuation over weeks/months</td>
<td>3 (13)</td>
<td>0 (12)</td>
<td>&lt;0.001</td>
<td>1.00</td>
</tr>
<tr>
<td>Any goal-directed movement</td>
<td>0 (13)</td>
<td>10 (13)</td>
<td>0.002</td>
<td>0.78</td>
</tr>
<tr>
<td>Context-dependent</td>
<td>0 (13)</td>
<td>10 (12)</td>
<td>&lt;0.001</td>
<td>0.84</td>
</tr>
</tbody>
</table>

Paulus T...Münchau A, Mov Disord 2021
Paediatric tic-like presentations during the COVID-19 pandemic

N=34

Sarah Buts, Morwen Duncan, Tamsin Owen, Davide Martino, Tamara Pringsheim, Susan Byrne, Andrew McWilliams, Tara Murphy, Osman Malik, Holan Liang, Isobel Heyman, Tammy Hedderly


![Image of London skyline]

- **Single diagnosis**
- **As part of multiple diagnoses**

**Number of patients with pre-existing diagnoses**

- Post-Traumatic Stress Disorder
- Intellectual Disability
- Specific Learning Disorder
- Attention-Deficit/Hyperactivity Disorder
- Obsessive Compulsive Disorder
- Depression
- Anxiety
- Autism Spectrum Disorder

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Traumatic Stress Disorder</td>
<td>2</td>
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<tr>
<td>Intellectual Disability</td>
<td>5</td>
</tr>
<tr>
<td>Specific Learning Disorder</td>
<td>2</td>
</tr>
<tr>
<td>Attention-Deficit/Hyperactivity Disorder</td>
<td>3</td>
</tr>
<tr>
<td>Obsessive Compulsive Disorder</td>
<td>1</td>
</tr>
<tr>
<td>Depression</td>
<td>2</td>
</tr>
<tr>
<td>Anxiety</td>
<td>5</td>
</tr>
<tr>
<td>Autism Spectrum Disorder</td>
<td>1</td>
</tr>
</tbody>
</table>

**Gender**
- M>F 4:1
- F>M 9:1

**Age of onset tics/tic-like movements (year)**
- Mean 4.14
- Mean 14

**Anxiety**
- 20%
- 68% reported, clinically diagnosed in 50%

**ASD**
- 5%–15%
- 12% reported, 57% clinically suspected (50% clinically diagnosed in subset of 14 GOSH patients)

**CGAS**
- Mean 59 (SD 7.9)
- Median 45 (range 35–75)

**Waxing and waning**
- Often present
- 32%

**Premorontory urge**
- 77%
- 62%

**Supressibility**
- Often present
- 99%

**Ball/echo/copro-like phenomena**
- Coprolalia and copropraxia in 12.4%–28%
- 77%

**First tics started in head/neck/rostrocaudal presentation**
- 90%
- 62%

**Yale Global Tic Severity Score**
- Mean 25
- Mean 62.6 (SD 19)

**Watching videos of 'tics' on social media**
- Unknown
- 77%

Velda X Han, Kasia Kozlowska, Kavitha Kothur, Michelle Lorentzos, Wui Kwan Wong, Shekeeb S Mohammad, Blanche Savage, Catherine Chudleigh and Russell C Dale

<table>
<thead>
<tr>
<th>Clinical features</th>
<th>Functional tics (n = 22), n (%)</th>
<th>CTD/TS (n = 163), n (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coprolalia</td>
<td>17 (77)</td>
<td>16 (10)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Complex words/phrases</td>
<td>10 (45)</td>
<td>1 (0.6)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Copropraxia-like behaviours</td>
<td>10 (45)</td>
<td>4 (2)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Self-injury</td>
<td>11 (50)</td>
<td>6 (4)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hospitalisation/ED</td>
<td>8 (36)</td>
<td>3 (2)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>School absentee</td>
<td>12 (55)</td>
<td>11 (7)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
FMD and FND: let rule-in signs rule!

**GENERAL SIGNS**
- Distractibility
- Variability
- Convergence spasm
- Eye movement abnormalities during examination
- Expressive behavior

**GAIT**
- Monoplegic leg dragging
- «Huffing and puffing» sign
- Falls toward support
- Excessive slowness
- Hesitation/caution
- Non-economic posture
- Sudden knee buckling
- Chair test

**FACE**
- Positive motor signs for hemifacial spasm or orolingual dyskinesia

**NECK/TRUNK WEAKNESS:**
- SCM sign

**LACK OF BALANCE:**
- functional Romberg

**LIMB**
- Discordance / inconsistency
- Give way weakness
- Co-contraction
- Positive motor signs for arm weakness: drift without pronation / abductor finger sign / flex-ext sign

**TREMOR**
- Distractibility / Increase in amplitude with weight / Entrainment

**TIC-LIKE BEHAVIORS??**

- Positive motor signs for leg weakness: Hoover sign / Abductor sign / spinal injury center test
A «global» look» at the «first» 143 patients

DEMOGRAPHICS AND COURSE OF ILLNESS
- **Later age**: median 14, mean 14.02, SD 2.2, range 8-24
- **Female predominance**: 93%
- **Abrupt onset during the pandemic**: 87%
- **Latency onset-peak variable**: <1 week 36%, 1-4 weeks 20%, 1-3 months 5%, >3 months 26%
- **Spontaneous remissions relatively rare**: (12%)

PHENOMENOLOGY
- **No rostro-caudal distribution**: 64%
- **Complex motor tic-like behaviors 85%**: >2/3 involved forceful upper extremity movements; 45% potentially ‘harmful’ motor actions
- **Complex vocalizations** (long, **context-dependent**)
- **Coprophenomena (48%)**: unconcealed, «comedic effect»
- **No premonitory urges**: 52% - **No suppressibility 54%** - **No relief after movement 58%**
- **Better when patient alone**: «variability» (Paulus et al., *Mov Disord* 2021)
- **Other FNS**: 43% (predominantly weakness, ‘fixed dystonia’, PNES)
A «global» look» at the «first» 143 patients

COMORBIDITIES

**OVER-REPRESENTED**
- Anxiety disorders: 72%
- Depressive disorders: 27% // Suicidal behavior: 18%

**UNDER-REPRESENTED**
- ADHD: 21%
- OCD/OCB: 11%
- Pre-existing history of tics: 11%

PRECIPITATING AND OTHER PREDISPOSING FACTORS
- «Non-tic» trigger(s) before onset: self-reported in 62.2%
- Previous exposure to video material of tics/tic-like behaviors: reported by 60.2% (TikTok predominantly) → some correspondence between patients’ and the tics on TikTok
- Previous in-person exposure to individuals with tics/tic-like behaviors: reported by 19.2% only (same social environment, either peers or relatives)
- Previous infections (1-4 weeks prior to onset): 6.3% → not COVID-19- or PANS/PANDAS-related!
- Previous medical conditions (1-4 weeks prior to onset – mostly allergies): 2.8%
Steady rise in incidence of functional motor disorders (FMD)

Hull et al. Neurol Clin Pract 2021

<table>
<thead>
<tr>
<th>Hull et al.</th>
<th>2021, Houston</th>
<th>5.1% of 665 new patients seen in a MDC between March and October 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>8.2% of 550 new patients in the same clinic between March and October 2020</td>
</tr>
</tbody>
</table>

[Paris, Salpetriere Machado et al., Mov Disord 2022]

OUTPATIENT SETTING

- TREMOR 53%
- DYSTONIA 31%
- MYOCOLONUS 18%
- TIC- and STEREOTYPY-LIKE 9%
- MULTIPLE TYPES 20%

EMERGENCY ROOM SETTING

- DYSTONIA 44%
- Paroxysmal 25.6%
- Fixed dystonia of hand 18%
- GAIT DISORDERS 41%
- TREMOR 10%
- TREMOR 10%
How can we explain this surge of FTLBs (and FMD/FND)?

Coping with the pandemic

2020

Information overload

Safety restrictions
• Social isolation
• Lockdown
• Fear for self and loved ones
• General health issues left out
• Growing financial insecurities

RISE IN PSYCHOSOCIAL STRESSORS
RISE IN ANXIETY LEVELS

ONSET OR WORSENING OF FND/FMD/FTLBS

2021

More attention drawn toward the body

Nocebo effects

ISOLATED CASES OF FND WITH ONSET AFTER VACCINATION

Information overload

Spread of erroneous beliefs «eHealth (il)literacy»

[Fasano & Daniele, 2021; Kim, Kung & Perez, 2021]
How can we explain this surge of FTLBs (and FMD/FND)?

The ‘other side’ of social media

Associations Between Time Spent Using Social Media and Internalizing and Externalizing Problems Among US Youth

Kira E. Riehm, MS; Kenneth A. Feder, PhD; Kayla N. Tormohlen, MPH; Rosa M. Crum, MD; Andrea S. Young, PhD; Kerry M. Green, PhD; Lauren R. Pacek, PhD; Lareina N. La Flair, PhD; Ramin Mojtabai, MD

GENERAL EXPOSURE

Greater risk or aggravation of internalizing problems
**TikTok Tics: A Pandemic Within a Pandemic**

Caroline Olvera, MD, Glenn T. Stebbins, PhD, Christopher G. Goetz, MD, and Katie Kompollit, MD

Keywords: tic, Tourette, tourettes  [March 2020–March 2021]  Mean age 18.8, more women

<table>
<thead>
<tr>
<th>Body distribution</th>
<th>Percent present in videos</th>
<th>Average tics per minute</th>
<th>Lifetime prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye</td>
<td>71.4</td>
<td>6</td>
<td>94%–100%&lt;sup&gt;13–15&lt;/sup&gt;</td>
</tr>
<tr>
<td>Head, neck and shoulder</td>
<td>89</td>
<td>7.25</td>
<td>89%–92%&lt;sup&gt;15&lt;/sup&gt;</td>
</tr>
<tr>
<td>Arms</td>
<td>85.7</td>
<td>11</td>
<td>51%–80%&lt;sup&gt;15&lt;/sup&gt;</td>
</tr>
<tr>
<td>Legs</td>
<td>1.4</td>
<td>0</td>
<td>40%–55%&lt;sup&gt;15&lt;/sup&gt;</td>
</tr>
<tr>
<td>Trunk and pelvis</td>
<td>0.89</td>
<td>0</td>
<td>41%–54%&lt;sup&gt;15&lt;/sup&gt;</td>
</tr>
<tr>
<td>Coprolalia</td>
<td>50</td>
<td>2</td>
<td>8%–14%&lt;sup&gt;13–16&lt;/sup&gt;</td>
</tr>
<tr>
<td>Echolalia</td>
<td>0</td>
<td>0</td>
<td>20%–44%&lt;sup&gt;15&lt;/sup&gt;</td>
</tr>
<tr>
<td>Vocal tics</td>
<td>100</td>
<td>23</td>
<td>87%&lt;sup&gt;17&lt;/sup&gt;</td>
</tr>
<tr>
<td>Motor tics</td>
<td>100</td>
<td>35</td>
<td>100%&lt;sup&gt;17&lt;/sup&gt;</td>
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<tr>
<td><strong>Total tics</strong></td>
<td></td>
<td><strong>29</strong></td>
<td>0–13 per minute&lt;sup&gt;18–29&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

"A modern clinician needs to remain abreast of social media sources as knowledge of media content is essential in managing patients in the current environment."
100 most-viewed videos under #tourettes in TikTok were randomly assigned to 2 of 3 primary reviewers (<2 years independent practice), all pediatric neurologists specializing in movement disorders.
The concept of Mass Social Media-Induced Illness

• Identification of «virtual index cases»

• First case observed before the pandemic (May 2019)

• Obvious analogy between patients and virtual index case

• As a result, M/F = about 1/1 in Germany

• «We do not believe that our patients should be simply diagnosed as Tourette-like FMD instead of being affected persons of an MSMI outbreak, since the first patients presented in our clinic only 3 months after launch of the YouTube channel Gewitter im Kopf, and all patients confirmed having watched these videos before—or in some cases even during—manifestation of similar or identical- symptoms»
The concept of Mass Social Media-Induced Illness

- Previous examples from medieval (dancing mania) to contemporary history (LeRoy, NY outbreak in 2012)
- Sociological determinants of its relationship with the pandemic:
  - ‘eco-anxiety’
  - direct consequences of lockdowns (home schooling, changes in communication amongst peers, family tensions)
  - ‘culture-bound stress reaction’ → seeking uniqueness and exceptionality «the ‘Fame Monster’ effect»
- Missing the ‘elephant in the room’ → predisposing psychiatric co-morbidity
• «We note the possibility that the high number of views, comments, and likes for these videos may have resulted in psychological and/or economic benefits to the individuals posting the videos.
• While many individuals in these videos express an interest in increasing TS awareness, the present analysis suggests a risk of creating a highly inaccurate perception of TS (see reactions of TGD and IVTS to Gewitter im Kopf [my note])
• This problem may exist for other disorders, as a recent study reported that some TikTok videos intended to create eating disorders awareness could be interpreted as portraying pro-eating disorders messages.»
How can we explain this surge of FTLBs (and FMD/FND)?

The ‘other side’ of social media

- Non-conscious mimicry $\leftrightarrow$ desire to affiliate
- Perception-behavior link $\rightarrow$ the «chameleon effect» [Chartrand & Bargh, 1999]
- Sharing videos $\rightarrow$ belongingness within the community of choice
- Attention/support from peers $\rightarrow$ inadvertent reinforcement
- Catalyst of global spread
«The human is indissolubly linked with imitation: a human being only becomes human at all by imitating other human beings»

‘Diathesis-stress’ model [Haltigan JD, 2021]

[Nilles, Pringsheim & Martino *Curr Opin Neurol* 2022 in press]
Social and adaptive functioning in FTLBs

**General Functioning:**
- WHO-DAS 2.0 / Child

**Resilient Coping:**
- Brief Resilient Coping Scale

**Distress Tolerance:**
- Distress Tolerance Scale

**Loneliness:**
- UCLA Loneliness Scale

**Belongingness:**
- General Belongingness Scale

**Family Functioning:**
- SCORE-15

**Participation:**
- CASP-youth or Participation Scale v. 6.0

**Insecurity/Mistrust & Proximity in Relationships:**
- Vulnerable Attachment Style Questionnaire

**Quality of Life:**
- WHO-QoL-Bref

**Suggestibility:**
- Short Suggestibility Scale

**Social Media Exposure:**
- Social Media Use Questionnaire

**Pandemic Experience:**
- COVID-19 Impact Scale

**Parental Distress, Parent-Child Dysfunctional Interaction & Child Difficulty:**
- Parental Stress Scale

**Screening for:**
- Borderline Personality Disorder
- Social Phobia and Social Anxiety
Treatment approach 1.

• Follow the approach used for functional neurological disorders
• Prompt diagnosis and expert review to clarify the phenomenology when necessary → Debriefing with the patient (see Hall-Patch et al., 2010)
  Validating symptoms as genuine and common
  Naming the condition
  Brief mechanistic explanation
• Addressing effective and ineffective treatments different from tics!
  Anti-tic medications ineffective in the vast majority of cases
  Prioritize behavioural therapy
  Fostering a hopeful sentiment of improvement
Treatment approach 2.

- **MULTIDISCIPLINARY – PERSONALIZED**
- Comprehensive Behavioural Intervention for Tics (CBIT) → “specific adaptation”

Function-based therapeutic strategies to understand the antecedents and consequences of tic-like behaviours

- **Mitigating potential triggering exposures, particularly social media content associated with tics** [PRECIPITANTS]
- **Initiating stress management interventions related to identifiable psychosocial stressors** [PRECIPITANTS]
- **Minimizing social reactions or attention to symptom expression** [PERPETUATING FACTORS]
- **Managing avoidance and accommodation → resume ‘healthy’ and pleasurable lifestyle** [PERPETUATING FACTORS]

- Address comorbid **anxiety and depression**, down-regulate arousal, improve sleep
- Other approaches? [e.g. hypnosis, etc.]
Biological, psychological and social components (MDT)

- Psychological
  - Implementation of routines
  - Emotion-regulation
  - CBT
  - Trauma-specific therapies

- School/family intervention

- Adjunct pharmacotherapy
  - Sleep regulation
  - Treatment of emotional symptoms
Prognosis: a hopeful endnote
[Howlett, Martino, Nilles & Pringsheim *Brain Behav* 2022]

**Prospective 6-months follow-up**

Yale Global Tic Severity Score

- Adolescents baseline: 35
- Adolescents 6-months FU: 25 (p=0.0007)
- Adults baseline: 30
- Adults 6-months FU: 40 (p=0.0006)

Total Tic-like behaviour Severity (0-50)

- Adolescents baseline: 20
- Adolescents 6-months FU: 15
- Adults baseline: 10
- Adults 6-months FU: 5

Overall Impairment (0-50)

- Adolescents baseline: 15
- Adolescents 6-months FU: 10 (p=0.03)
- Adults baseline: 5
- Adults 6-months FU: 10

**Treatments used**

- Alpha-agonists: Adolescents 10, Adults 10
- Antipsychotics: Adolescents 5, Adults 10
- SSRI: Adolescents 10, Adults 10
- Non-SSRI antidepressants: Adolescents 5, Adults 5
- Stimulants: Adolescents 10, Adults 10
- CBT for anxiety/depression: Adolescents 10, Adults 10

Prognosis: a hopeful endnote

[Howlett, Martino, Nilles & Pringsheim *Brain Behav* 2022]

*p*=0.0007
*p*=0.0006
*p*=0.03

*Yale Global Tic Severity Score*
OUTLOOK TO THE FUTURE

1. Diagnostic criteria or features influencing diagnostic confidence
2. Specific and shared Risk Factors
3. Specific and shared Pathophysiology
4. Specific Treatment Pathways
OUTLOOK TO THE FUTURE

ASSESSMENT

MULTIDISCIPLINARITY:
Psychiatry / Neurology / Clinical Psychology / Neurophysiology Social Studies

SOCIETAL INTERVENTION:
Official statement to plan prevention?

INDIVIDUAL TREATMENT PATHWAY
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LONG LIVE THE

ESSTS!