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# The changing landscape of childhood tic disorders following COVID-19

Olivia Horner  
 Tammy Hedderly  
 Osman Malik

## Abstract

The article describes classification, aetiology and features of typical tic disorders (Tourette syndrome) and their management with an additional focus on a surge in atypical tic presentations following the COVID-19 pandemic, often described as functional tics, or functional tic-like movements. We discuss what explains their atypical nature and what might underpin this increase in incidence. Lastly the article provides an overview of management of functional tics, so readers can understand how management of these differs from typical tic disorders.

**Keywords** COVID-19; functional tics; tic-like movements; tics; Tourette

## Introduction

Over the course of the COVID-19 pandemic, there has been a reported surge in paediatric tics, especially affecting female adolescents. In light of this increase, this article aims to highlight some key issues for primary care physicians, therapists and paediatricians. The possible mechanisms involved in the escalation of presentations will be briefly discussed and consideration given to how this relates to the current COVID-19 pandemic stress and other societal/environmental factors.

By its very nature, Tourette syndrome has appealed to popular culture and attracted media attention. People are often fascinated by unexpected, public utterances of expletives and the

**Olivia Horner**, Fourth year medical student, Trinity College Dublin, The University of Dublin, Dublin 2, Ireland. Conflicts of interest: none declared.

**Tammy Hedderly MBBS FRCPCH**, Consultant Paediatric Neurologist, TANDeM (Tics and Neurodevelopmental Movement Disorders Service), Department of Children's Neurosciences, Evelina London Children's Hospital, St Thomas' Hospital; King's Health Partners Academic Health Science Centre; Guy's King's and Saint Thomas' School of Medicine, London, UK. Conflicts of interest: none declared.

**Osman Malik MBBS MRCPsych**, Consultant Child and Adolescent Neuropsychiatrist, TANDeM (Tics and Neurodevelopmental Movement Disorders Service), Department of Children's Neurosciences, Evelina London Children's Hospital, St Thomas' Hospital; King's Health Partners Academic Health Science Centre; South London and Maudsley NHS Foundation Trust, London, UK. Conflicts of interest: none declared.

unpredictable nature of the movements that interfere with the person's life. However, it is debatable whether it is helpful displaying these patients in the media, even when consent is given.

A more recent controversial issue has arisen following the explosion of social networking apps to raise awareness, educate and to sometimes make jokes or entertainment out of 'tics' and 'tic-like' movements. For example, on opening the overwhelmingly popular social networking app 'TikTok', videos can be easily found of people with tics talking about their experience as well as promoting jokes around daily activities like baking or cooking, sometimes displaying movements incongruous with the tics they are intending to portray.

While there are clear potential benefits in raising awareness of any condition, offering a sense of belonging or potentially helpful management advice — there are also clear drawbacks. One important feature of tics is that they are highly 'suggestible'. It is important not to draw attention to the tics and tic-like behaviours, or to reinforce them. This begs several questions, does posting videos of oneself 'ticking', getting thousands/even millions of views (sometimes for payment) constitute reinforcement and therefore drive a worsening of symptoms in the viewers? There are also probably vulnerability factors that make some viewers more vulnerable.

Paediatric neurologists and psychiatrists anecdotally began to draw connections between adolescent patients, more usually females, presenting with functional tic-like disorders and social media use. Several of these reported viewing of social media content involving tic-like attacks, as well as other behaviours associated with functional neurological disorders such as non-epileptic seizures. Some preliminary analysis of this group of young people has shown the importance of considering wider vulnerability factors such as anxiety disorders, depression and autism spectrum (all of which was often undiagnosed) to identify children more at risk of functional neurological disorders and those requiring treatments.

## Classification of tic disorders

Tics can be either complex or simple, and they are defined as 'sudden, rapid, repetitive, non-rhythmic, inapposite, irresistible, muscle movements or vocalisations'. Transient tics affect up to 20% of school age children, and therefore diagnosis and labelling with a 'tic disorder' is only indicated if the specific DSM-5 diagnostic criteria are met. Tics themselves are largely considered to be benign, not causing harm or developmental impairment. However, there are strong associations between tics and significant neurodevelopmental, neuropsychological and psychiatric difficulties with high rates of neuropsychiatric co-morbidities including obsessive compulsive disorder and ADHD. This is an important feature of the management of these children, and it is important to conduct a full assessment.

There are 3 tic disorders included in the DSM-5: Tourette syndrome, persistent (chronic) vocal or motor tic disorder and provisional tic disorder. These are neurodevelopmental disorders and the criteria are listed in [Table 1](#).

## What to look out for: common motor and vocal tics

Children with tics can be sent to allergy specialists for sniffing frequently, or ophthalmology for blinking and unusual eye

movements, or even the emergency department. Common motor and vocal tics are listed in a questionnaire scale called the Yale Global Tic Severity Scale (YGTSS); this scale can be very helpful for someone doing an assessment as it helps them keep various tics in mind and they know to ask about these. Common motor tics include: facial movements, eye blinking, eye rolling movements, nose movements (sniffing, nose scrunching), mouth movements (pouting, grimacing), head movements - neck jerking, headbutting and shoulder movements such as shrugging. Common vocal tics include: random sounds, noises e.g. coughing, grunting, sniffing, imitating common sounds; shouting out syllables and full words. Coprolalia or swearing, inappropriate words are only seen in about 15–20 % of individuals with Tourette syndrome.

### Epidemiology

About 1 in 100 school children have tics. The ratio of boys to girls in patients with Tourette syndrome has traditionally been quoted as 3–4:1. However, there has been a recent shift in patients presenting to clinics, with a cohort of predominantly adolescent female patients presenting since the beginning of 2020.

### Aetiology and pathophysiology

The aetiology of tics is complicated and multi-factorial. There is a clear genetic contribution to their aetiology. Tics are highly

heritable, with 87% concordance in monozygotic twins and infrequent *de novo* presentations. However there is no single gene that accounts for this diverse and heterogenous condition.

The historical interpretation of tics as a manifestation of anxiety or stress holds some truth as they can certainly be exacerbated by emotion, but anxiety is not the causal factor. Several neurobiological mechanisms have been suggested in particular the atypical connectivity in the cortical-striato-thalamic-cortical circuits is most well established, as well as aberrant neurotransmitter function with several neurotransmitters implicated but best described is hyper-dopaminergic transmission in the basal ganglia. More recent research implicates involvement of other brain areas, such as the limbic system, mid-brain and cerebellum.

In the last 30 years interest has also grown at looking at immune mechanisms involved in the aetiology of tic disorders of a subset of children with Tourette syndrome, albeit these children may have an underlying genetic vulnerability to tics. Paediatric Autoimmune Neuropsychiatric Disorder Associated with Streptococcus (PANDAS) was described by Susan Swedo in 1998 proposed to tackle the issue of autoimmunity and its role in the aetiology of sudden onset Obsessive Compulsive Disorder (OCD) and Tics in childhood. In PANDAS it has been proposed that, following an infection, antibodies form against the invading microorganisms, cross the blood brain barrier and attach themselves to certain receptors in the basal ganglia thus causing OCD/Tics. It is further postulated that these neurons are likely to be in the basal ganglia and antibodies tend to bind to dopamine receptors, or the surface of striatal cholinergic interneurons thus modulating their activity and causing tics and other PANDAS symptoms. Since the exact antibodies remain yet to be detected, the mechanism described above is a postulated hypothesis based on other illness models and clinicians' experience.

Thus, due to lack of empirical scientific evidence, there is controversy concerning the PANDAS label. The PANS terminology later suggested by Swedo, Leckman and Rose in 2012, removes the auto-immune term from the title and standing for 'Paediatric Acute Neuropsychiatric Symptoms' (PANS). PANS is an umbrella term that encompasses a whole list of possible aetiologies. It provides a symptom description for children who experience very sudden onset of neuropsychiatric symptoms such as OCD. Although some researchers describe autoimmunity as one of the main aetiologies in sudden onset OCD that presents with features including tics the role of autoimmunity in these children has not been clearly established.

### Assessment

A systematic history is important to understand the course of the child's symptoms. We particularly want to know:

- 1) When did the tics start?
- 2) How frequent are the tics
- 3) Are there any exacerbating factors? Do the symptoms wax and wane or are they persistent?
- 4) What type of tics is the child experiencing? How have they progressed?

It is important to understand that patients with tic disorders experience changing tics, new tics will develop and old ones will improve over time. The progression of the tics often follows a 'rostral-caudal' pattern i.e. may start off with eye movements or

#### Classification of tic disorders

Tourette syndrome	Two or more motor tics AND one or more vocal tic (not necessarily at the same time) Tics last at least a year - distribution can vary but should be almost every day, usually occur in bouts Onset before 18 years of age No other medical condition or factors (e.g. drug use) which may be causing symptoms
Persistent/chronic tic disorder	One or more motor tics or vocal tics (not both) Tics occur many times a day almost every day or on and off throughout a period of more than one year Onset before 18 years of age No other medical condition or factors (e.g. drug use) which may be causing symptoms No diagnosis of Tourette syndrome
Provisional tic disorder	One or more motor tics or vocal tics Present for no longer than 12 months in a row Onset before 18 years of age No other medical condition or factors (e.g. drug use) which may be causing symptoms Not have been diagnosed with Tourette syndrome or persistent tic disorder

Table 1

nose twitching and then develop neck jerking etc. Tics do NOT usually interfere with a specific action as they are action independent and will suppress when an action is performed

- 5) A detailed description of the nature of the movement - can the patient control it or is it sudden and unexpected? Is there an element of suggestibility?
- 6) Is there pre-motory urge? Remember to ask the child - what does it feel like before you do these movements/vocalisations? Patients will report feeling as though they absolutely have to perform the tic, almost like an itch that needs to be scratched.
- 7) Does the child have any symptoms of co-morbidities such as ADHD or compulsive behaviour? It is particularly important to ask about compulsions - some children with tics describe feeling that if they don't perform the movements something bad will happen e.g. their family will be hurt. This evidently can have a severe psychological impact, especially if they are being asked to stop.
- 8) Family history is usually significant in tic disorders but can present as anxiety, compulsions, OCD and/or ADHD. It is also important to enquire about siblings, as there are often behavioural issues within families.
- 9) Is there any evidence of neuro-developmental difficulties or any developmental delay/other motor disorder.
- 10) Particularly in adolescent patients, has there been any substance misuse?
- 11) How does the patient feel about the movements? This is key to differentiating tic disorders from other movement disorders like motor stereotypies, as well as the psychosocial management of the condition. Patients sometimes report finding their tics funny or enjoyable.

The Yale Global Tic Severity Scale can be used in conjunction with a comprehensive history and exam for assessment of patients with tics. It is the gold standard for assessment and is an effective way to determine the impact of the child's tics on their life. It provides a 'checklist' of possible common tics that might be experienced and records the number, frequency, intensity and degree of complex tics. It also asks the patient to describe the degree of interference in daily behaviours and communication and the level of impairment they cause. This is a very useful tool for clinicians who are assessing the child, as it can be used to inform the management of the child and identify the biggest areas of concern.

A neurological examination should be performed. It helps to establish whether the movements cause dyskinesia or can be induced. As part of the examination, look for other symptoms including cerebellar dysfunction, chorea, myoclonus and tremors or dystonia.

### Important differentials to consider

It is important to differentiate between the tic disorders and other movement disorders. Interested clinicians may want to keep the differential diagnoses in [Box 1](#), in mind.

Amphetamines, methylphenidate, and cocaine are known to cause chorea, tics, and stereotyped movements. Keep substance use in mind for sudden new late onset tics.

Functional tic-like movements have been more commonly seen since the emergence of COVID-19. Functional tic-like attacks can occur in isolation or in those with pre-existing tic disorders.

### Differential diagnoses of tic disorders

Functional tic-like movements	Post-encephalitis
Complex motor stereotypies	Sydenham's-RF
Myoclonic jerks/hypnic jerks	Stroke
Dystonia	Toxins/drugs
Chorea	Head trauma
Drug induced movements	Neurodegenerative disorders
Focal seizures	Wilson's
Hyperekplexia	Metabolic disorders
Benign eye-lid myokymia	Neuroacanthocytosis
Paroxysmal dyskinesias	Neurofibromatosis

#### Box 1

Tic-like attacks are characterized by severe bouts of un-suppressible and debilitating tics which may last for minutes or hours. There is often (but not always) a trigger to these attacks, or they are precipitated by some form of distress. Ultimately, they are best seen as a combination of existing typical tics and a form of 'panic attack' or severe functional anxiety. This kind of functional episode is commonly being seen in the cohort of predominantly female adolescent patients presenting during the pandemic.

Tourette syndrome (typical developmental tics) is more likely to be the diagnosis if there is an early age of onset (3–8 years), male gender, positive family history or past psychiatric history of a behavioural disorder such as ADHD or OCD. Consider functional tic-like movements if: the onset occurs in adolescence, is very sudden or abrupt and/or if the movements only occur in certain environments such as school. Functional tics often do not follow a rostro-caudal pattern, and start with limb flailing as an early tic, escalate very quickly and become self-injurious tics with weeks of onset. [Table 2](#) summarises the key differences between typical tics and functional tics (functional tic-like movements).

### Management of tic disorders

A multidisciplinary approach, often with brain training/behavioural interventions is imperative for management of tic disorders. It is very important to understand that tics are harmless unless they are causing functional impairment or significant distress, only when treatment is indicated. Treating the comorbidities such as ADH, OCD and Anxiety Disorder in many situations can improve the presentation of the tics significantly.

The pyramid ([Figure 1](#)) shows the stepwise approach to tic management. The base of the pyramid describes teaching parents and children about the benign nature of tics and encouraging a 'non-suggestibility' technique, which is prioritized in family psychoeducation. Essentially, it is important to avoid positive reinforcement of tics. This active-ignoring of tics is also an important factor in functional tic-like attacks. Talking about the tics and asking the child too much about their tics has been shown to worsen the symptoms. This is normally not a case of intentional attention seeking behaviour and does not mean that the tics are conscious, rather we highlight that suggestibility is an important psychological feature of tic disorders.

### What has changed in the COVID-19 pandemic?

A worrying increase in tics has been reported by clinicians in at least 8 specialist Tourette clinics across the world. The presentation is generally more typical of functional episodes however almost half (44%) of presenting children have a background of a previous tic disorder diagnosis. Particularly prominent and distressing ‘tic attacks’ occur with almost half of patients presenting to emergency departments initially.

This phenomenon has affected predominantly girls, particularly those of an adolescent age range, with a higher average age of onset than typical tic disorders. Buts et al found an average age of onset of these rapid movements to be 13.7 years. The cohort of patients studied by Buts were found to have significantly increased prevalence of comorbid neuropsychiatric disorders (91%) and the majority reported some symptoms of anxiety.

The root causes of this sudden increase in functional tic-like disorder are unknown. However, pre-existing morbidity and social media may play a role. On searching ‘Tourettes’ in the popular video social networking site ‘TikTok’, the first user that appears has over 4 million ‘followers’. Scrolling down the page, videos of varying content can be seen. Most are aimed at ‘destigmatizing’ tics in a ‘comedic’ manner, some are raising awareness for the disorders, some are just used as a platform for people with tics to make videos like anyone else.

Given the suggestible nature of this functional disorder, and its association with increased anxiety, distress and other psychiatric comorbidities, sharing of this content seem both risky and worrying. In our experience, when children and young people with functional tic-like disorder are asked about social media use, most report some experience of this type of content. Those who had not viewed the social media content had seen other young people at school with tics or had close friends who had developed tics. Therefore, the wide presence of tics in the environment (online or

offline) coupled with increased overall stress likely permeated the unconscious mind of many vulnerable and suggestible young people who may have had longstanding unmet mental health, educational and development needs.

Most patients we see have at least one neurodevelopmental vulnerability. Other environmental and social factors (such as return to school where either there are longstanding academic difficulties or friendship problems or bullying) need to be considered as the timing of onset of functional tics is important.

### Management of functional tic-like movements

Whilst COVID lock-downs and widespread presence of tic related videos on social media may have been, in part, contributory factors these cannot be easily controlled/eliminated (albeit we do talk to young people and parents about the role of these videos and suggestibility of tics). Predominantly, we aim to understand the individual and systemic trigger factors for each of the patients to help them. Social media is here to stay, although hopefully more awareness of monitoring the content is highlighted.

Functional symptoms are often complex and may represent an underlying conflict or stress or trauma that the child is unable to process or verbalize which can come out as a physical symptom. Hence a key part of management is to explore current and past factors that may need intervention. Some of this therapeutic work is provided by the school wellbeing services and when necessary, child mental health services.

Current environmental stressors can include a variety of things such as problems in school, learning difficulties (LD), teachers, friendship issues, bullying or stress in the home-environment such as a sibling or parents being unwell. Once again not all stressors can be eliminated but if explored, they can be modified or the child can be equipped with strategies to manage the anxiety.

Children with functional tics often have unmet needs/diagnoses such as ASD, ADHD or LD. For instance, if a child had a cognitive assessment showing they had a global or specific learning problems then modification in their academic targets and extra support at school often resolves the functional symptoms or if a child is worried about parental illness then an open dialogue to explore this is helpful.

One other key aspect of managing functional movements is redirecting attention away from symptoms (e.g. functional tics); where adults/teachers/parents endeavour not to ask questions about the symptoms, nor ask the child to stop the movements; we encourage not giving any attention verbally or physically to the symptoms — such as reassuring the child during an episode or holding their hands/rubbing their back etc. All attention must be withheld and re-directed to the child when they are not in an episode or when not showing functional symptoms. Although parent interaction during a functional tic-attack may feel reassuring but it sustains these attacks.

At home we also stress on parents not to be worried about the child’s presentation once they have understood the nature of the condition, i.e., nothing dangerous has happened to the brain. Health anxiety in the parents (which is understandable) can fuel the functional symptoms further.

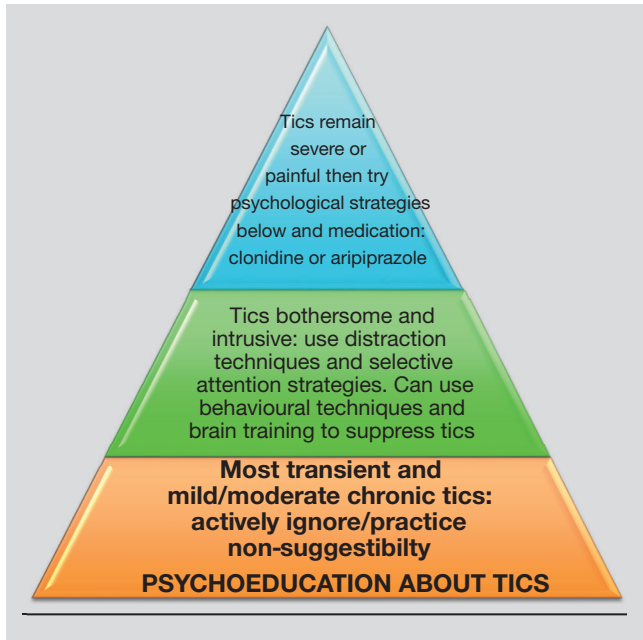
There is often some inherent vulnerability (or a biological predisposition) in the child to develop functional symptoms. It has been shown through research and clinical experience that

#### Distinguishing between tics and functional tic-like movements

Tics	Functional tic-like movements
Typical age of onset 4–7 (median 5)	No typical age of onset but usually 12 onwards and more in adolescence
Urge is often reported to preceding the tic	Often no identifiable/reported urge preceding the tic
Suppressible (often brief)	Not suppressible, lack of sense of agency and often prolonged writing attacks of complex looking movements
Rostro-caudal development of symptoms	Does not follow rostro-caudal development
Positive family history of tics	Family history of tics often not present, unless the child also has typical tics
Co-morbidities include ADHD/OCD/anxiety	Usually comorbid anxiety/mood problems/ASD traits/panic attacks/other functional symptoms

Table 2





**Figure 1** Management pyramid for tic disorders. Reproduced from reference 1 with permission from Elsevier.

children who are not great at feeling and verbalizing emotions (alexithymia) tend to present more often with functional symptoms. Some children also say they are not bothered by their functional symptoms. Teaching these children about emotions – emotional literacy support followed by helping them to learn emotion regulation strategies is very helpful. Also using cognitive behaviour therapy for managing anxiety is useful and can follow after emotional literacy and emotional regulation support.

We also encourage young people to try to selectively attend to (focus on) a stimulus outside their body when they are having the functional symptoms or feel that they will have them. There are a range of attention re-directing strategies for young people e.g. listening to music, doing a maths puzzles, colouring, etc. or some highly focussed tasks such as focussing on the sensation of air inside the nose while breathing or focussing on the smell and taste of a food item.

In many children with functional symptoms, we note traits such as easily getting startled, some have higher focus on inner bodily sensations (interoceptive awareness) and they can do attention training to disengage from bodily symptoms and interpreting them as threat signals.

We often talk about gains from a functional symptom i.e. whilst the symptoms are out of conscious control but symptoms can potentially help the child with something, such as prevent them from going outside the house (thus reducing social anxiety) or preventing the child from going to school (reducing school anxiety), or seeking closeness/attention from parents etc. (reducing separation anxiety). The aim of treatment is to rehabilitate the child back to their previous functioning by addressing

the hurdles that increase their anxiety to return to life before the onset of functional symptoms. A useful website to read about functional neurological symptoms is: [www.neurosymptoms.org](http://www.neurosymptoms.org).

## Summary

Tics and tic-like disorders are common in children. However, they have become more prevalent in many countries since the COVID-19 pandemic. The reasons behind these changes are uncertain, although it seems likely that a combination of increased stressors on vulnerable groups of young people combined with an abundance of reporting on social media platforms has contributed to this rise. It is probably more than unfortunate coincidence that one of the biggest social media platforms in the world, TikTok, is a partial homonym for tic. The particular increase incidence seen in adolescent girls, presenting with acute and severe features is worrying. For healthcare professionals encountering children with tic disorder, it is important to pick management strategies that relate to the underlying diagnosis. Children with most tic disorder often do worse when these tics become the focus of attention, and strategies that can help to prevent this alongside appropriate reassurance are helpful in managing them. ◆

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