Tic Attacks in Tourette Syndrome:

Defining Diagnostic Criteria, Impacts of Comorbidities, and Tic-Related Temporary Disabilities

Presented By:

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About Me

Jeremy Rosenbaum

- Diagnosed with TS at 14
- B.S. in Exercise Physiology from CSU, Chico
- Keck School of Medicine of USC (Class of 2027)
- This project began in 2020 as my honors thesis

Overview

Background

Information on tic attacks

02. Objectives

Improve diagnosing standards and better understand the impact of comorbidities

03. Adapted Definition and Framework

Redefine tic attacks, and discuss interplay with various comorbidities

04. Conclusions

Overall results and impact

01.
Background:

Brief overview of Tourette Syndrome and tic attacks

Tourette Syndrome as a Spectrum

- Among other criteria, a TS diagnosis requires the presence of both motor and vocal tics
- The presentation of tics varies in frequency, duration, and severity
- Recognizing that TS manifests differently among individuals, it can be inferred that tic attacks can be uniquely individual experiences as well

What are Tic Attacks?

- An underreported phenomenon in TS that is broadly described in the literature as being severe bouts of disabling, non-suppressible, continuous tics
  - In one study (Collicott, 2013), 8.7% of 369 patients were identified as having tic attacks
  - Notably, the authors point out that this is likely an underestimate due to a “reliance on clinical assessments which may not have included systematic enquiry on this point” (Collicott, 2013)

02.
Objectives:

Improve diagnosing standards for tic attacks and better understand the impact of comorbidities

Objectives

Building a Diagnosis Standard

Those who suffer from tic attacks should have a tangible criteria that can be referenced

Tic-Related Temporary Disability

Recognizing moments of temporary disability is essential for adequate accommodations

Impacts of Common Comorbidities

TS has many comorbidities, and it is helpful to understand how each one may impact TS and tic attacks

03. Diagnostic Criteria & Framework:

Redefining tic attacks and discussion of interplay of TS with various comorbidities

Tic Attack Diagnostic Criteria

- Common aspects of tic attacks described in the literature include terms such as
  - Severe
  - Continuous
  - Non-suppressible
  - Disabling
  - Varied duration
    - 3 minutes to 3 hours (Collicott, 2013)
    - 15 minutes to several hours: case reports referred to by (Collicott, 2013) & (Robinson, 2016)
- Despite a heightened awareness in recent years, there is currently no consensus criteria that need to be met for a tic attack diagnosis

Existing Psychological Model of Tic Attacks

- Developed from a case study of a 10th grade male student
- Addresses anxiety as part of a cycle
- Incorporates functional safety behaviors

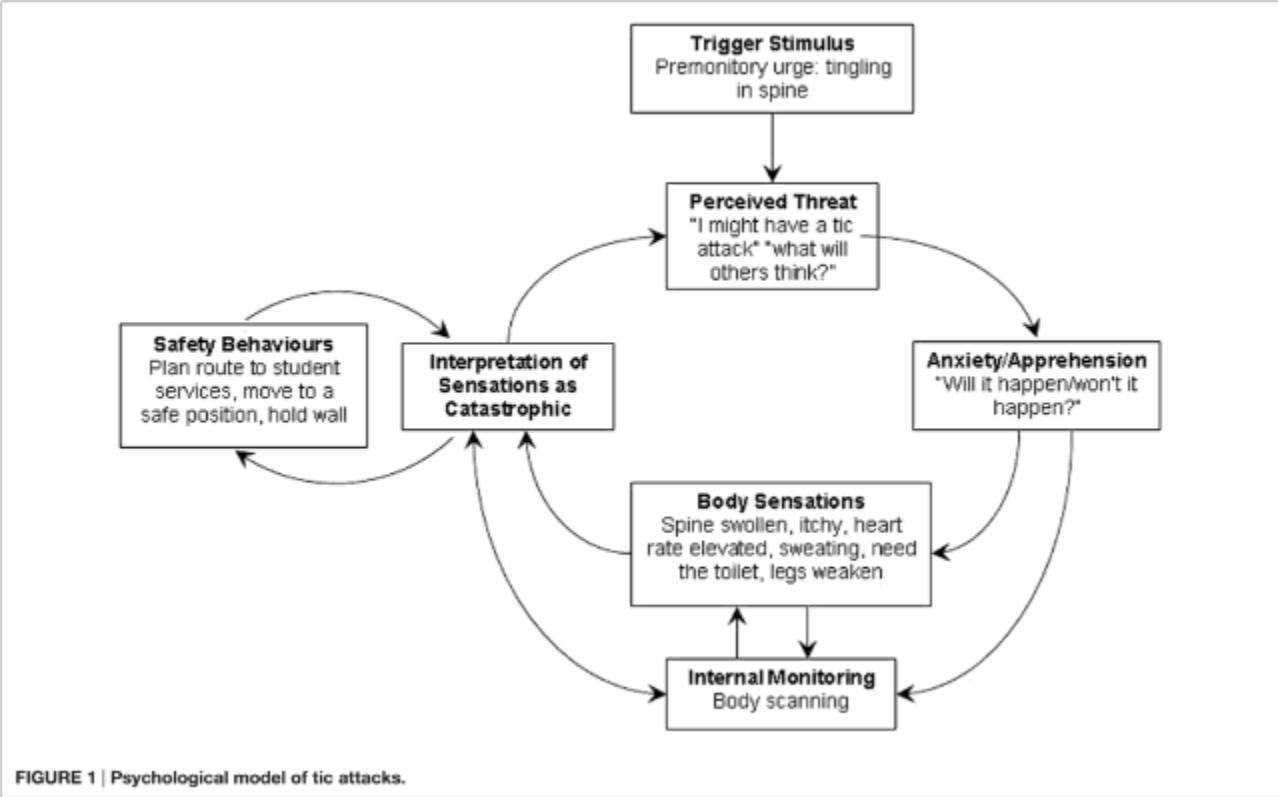


FIGURE 1 | Psychological model of tic attacks.

(Robinson, 2016)

Incorporating the YGTSS

- The Yale Global Tic Severity Scale consists of two parts:
  - A semi-structured interview
  - A questionnaire
- Excels in assessing the severity and interference of tic symptoms
  - Utilizes multiple 0-5 scales
- While the YGTSS is generally not considered a tool to diagnose or classify an individual's tic disorder, the severe and disabling characteristics of tic attacks may be strongly inferred from the results if administered in a specified fashion

Important Considerations

- Baseline severity of tics
- Volume/frequency of tics during episode
- Intensity of tics during episode
- Tic-related sensory phenomena
- Increases in tics causing disability

Determining Baseline Severity

- TS often presents with tics waxing and waning over time, so periodic assessments over an extended period of time is ideal
- Multiple measurements can be used to assess a baseline
  - In the case of pediatric patients, the YGTSS has also been shown to be a promising tool as a parent-reported assessment (Ho, 2020)

Baseline Assessment Example Protocol

- Full YGTSS (interview + questionnaire) assessment conducted by trained clinician during each visit
- Partial YGTSS (questionnaire only) assessment conducted at home once per month
  - May be conducted by the individual or by a parent if appropriate
- Scores and subscores can be averaged to determine baseline
  - Considering the impact of age on the development of and presentation of TS, a baseline is subject to change over time

High Frequency Tic Criteria

- ‘Severe’ is the YGTSS highest category for frequency
- The description for ‘severe’ includes
  - Specific tics present virtually all the time
  - Tic free intervals do not last more than 5 to 10 minutes
  - Bouts of tics are very common and occur in multiple settings

High Frequency Tic Criteria

- If an individual falls within the severe category at a given moment, a bout should be classified as high frequency, regardless of baseline level
  - Considering the association between severe TS with tic attacks, further distinction within the ‘severe’ YGTSS category may be useful
- To more directly tailor toward assessing tic attacks the following changes may be made:
  - Adjusted time frame (i.e. duration of disabling bout)
  - Comparison to a baseline frequency (i.e. tics per minute)

Special Considerations Regarding Frequency

- Importantly, a minimum tics/minute value should not be a necessity for diagnosing a tic attack, as it would not account for circumstances in which:
  - Fewer, high severity or complex tics impair function
  - Sensory phenomena or other non visible circumstances impair function
  - Circumstances in which certain tics will significantly impair function, regardless of frequency (i.e. breathing tic underwater)

Tic-Related Sensory Phenomena

- Tics are often accompanied by internal sensory phenomena, such as premonitory tic urges and anxiety-related physiological sensations
- To best assess increases in sensory phenomena, a simple 0-5 scale based on an individual's self-assessment will suffice

1: Minimal

3: Moderate

5: Severe

Sensory Phenomena Assessment

- Regarding specific populations where this may be most prevalent, it was found that awareness of premonitory urges is present in as many as 90% of adolescents (Bloch, 2009)
    - 60% of those with premonitory urges find them more distressing than the tics themselves (Cohen & Leckman, 1992)
- Often related to suppression of tics, sensory phenomena are only experienced by the individual
- This is an important component of TS that is not significantly incorporated into the YGTSS

High Intensity Tic Criteria

- ‘Severe’ is the YGTSS highest category for intensity
- The description for ‘severe’ includes
  - Tics are extremely forceful or exaggerated in expression
  - Call attention to the individual
  - May result in physical injury (accidental, provoked, or self-inflicted) because of their forceful expression

Tics Causing Disability

- Due to their diversity, tics may inhibit speaking, walking, talking, breathing, seeing or any other normally voluntary bodily function.
- Understanding this, it is important to assess if the current tics are making an individual unable to:
  - Complete an action/activity
  - Complete an action/activity that they can perform at their baseline

Interference & Impairment

- For the purpose of identifying tic attacks, the YGTSS criteria for both interference and impairment may directly indicate varied forms of disability
- Paraphrased definitions from the YGTSS:
  - Interference: Disruptions of intended action or communication
  - Impairment: Tics detrimental to self-esteem, family life, social acceptance, school or job functioning
- To fall under the severe criteria for either of these categories, the following adaptations may be made:
  - Time frame limited to the duration of the bout of tics
  - A near-continuous presence of tics falling under the interference or impairment severity criteria

Fluidity of Temporary Disability

- Tics can shift rapidly, and an activity that is easily accomplished one moment may be greatly impaired the next
- Temporary disabilities can occur during bouts of tics that are significantly above the individual's baseline severity
- It is important for the individual and those around to handle bouts in a safe and understanding way

Example of Tic-Related Temporary Disability

- An individual has two tics present on a given day: blinking and shouting
- During periods where blinking is the dominant tic, visual activities may be impaired but speaking activities will be minimally impacted
- During periods where shouting is the dominant tic, visual activities will be minimally impacted but speaking activities may be impaired

Assessment of Tic Attacks

- Just as the YGTSS is normally scored, all scales will range from 0-5
  - 0: None
  - 1: Minimal
  - 2: Mild
  - 3: Moderate
  - 4: Marked
  - 5: Severe

Proposed Assessment of Tic Attacks

Criteria to be met:

- Frequency and/or intensity is determined to be severe (5)
- Interference and/or impairment is determined to be severe (5)

OR

- Frequency and/or intensity is determined to be marked (4)
- Tic-related sensory phenomena is determined to be severe (5)
- Interference and/or impairment is determined to be severe (5)

Common Comorbidities of TS & Tic Attacks

ADHD

Anxiety Disorders

OCD

Sleeping Disorders

Age

High TS Severity

ADHD

- ADHD can:
  - increase distractions, possibly including those of sensory phenomena
  - Create additional restlessness
  - Further reduce impulse control
- Those with significant vocal tics may be particularly impacted with additional speech at inappropriate times
- Individual with TS + tic attacks have shown a significantly higher rate of ADHD than those without tic attacks
  - 56% v 29% (Collicott, 2013)

ADHD Cont.

- Other studies have shown differing rates of comorbid ADHD for those with TS that did not evaluate the presence of tic attacks
  - 21%-90% (Robertson, 1992)
    - population: clinic populations
  - 60%-80% (Cavanna, 2009) (Khalifa, 2005) (Zhu, 2006)
    - population: children
  - 61% (Ghosh, 2014)
    - population: children
  - 65% (Faith, 2020)
    - population: prisoners with violent offenses

Anxiety

- In one study investigating tic attacks, 12 out of 12 TS + tic attack children participants presented with at least one anxiety disorder (Robinson, 2016)
    - In contrast, another study found the prevalence of anxiety disorder within a general TS population (of children) to be 24.6% (Steinberg, 2013)
- Nervousness is often felt in situations where the individual perceives TS as impacting their ability to function at a normal level or is creating uncomfortable dynamics
- Negative thoughts or obsessions on tics can lead to a vicious cycle in which tics cause negative thoughts and vice versa

Panic Attacks

- Panic attacks are a sudden feeling of acute and disabling anxiety
- One study (Comings, 1987) found an association between panic attacks with TS, and an even stronger correlation with severe TS:
    - TS patients: 33%
    - Severe TS patients: 55.2%
    - Control population: 8.3%
- And for those having more than 3 panic attacks within 1 week:
    - TS patients: 15.9%
    - Severe TS patients: 31%
    - Control population: 0%

The Positive Feedback Loop of Tics + Anxiety

1. A tic occurs that impacts the individual's ability to function as they see fit
2. They have negative beliefs based on these tics
3. These negative beliefs lead to a worsening of anxiety and a lessened control over tic suppression
4. Additional tics occur

***This cycle can repeat indefinitely**

OCD

- OCD has a prevalence rate of 1.9-3.2% in the general population, but 11-80% in the TS population (Robertson, 1989)
- Largely revolves around uncontrollable, recurring thoughts and/or behaviors
- TS often presents irregularly and nonuniform, and OCD may become triggered by this
- Obsessions or recurring behaviors caused by OCD are often based on irrational thoughts
  - A common example is of perceived inequality

The Positive Feedback Loop of Tics + OCD

Example:

1. A tic occurs in a limb on the right side
2. OCD obsession occurs due to the tic, and a new obsession about asymmetry occurs
3. An uncontrollable urge develops for a new equal tic on the left side
4. The tic repeats itself on the left side
5. A new obsession occurs, in that the tic has now occurred more recently on the left side than the right

***This cycle can repeat indefinitely**

Sleeping Disorders

- For many, it may seem that sleeping is the best way to break a positive feedback loop involving tics
- However, a significant percent of those with TS also have diagnosable sleep disorders
  - Studies have shown sleep disorders as a comorbidity of TS regardless of ADHD status (Ghosh, 2014)
  - Other studies have demonstrated that sleep disturbances were more severe in those with comorbid ADHD (Jimenez-Jimenez, 2020)

Sleeping Disorders

- A recent study (Blaty, 2022) found that patients with TS have:
    - Tics during both REM and NREM sleep
    - Less total sleep time
    - Lower sleep efficiency
    - Elevated arousal index
- Sleep deprivation can lead to worsening of symptoms and raise the risk of many other additional diseases

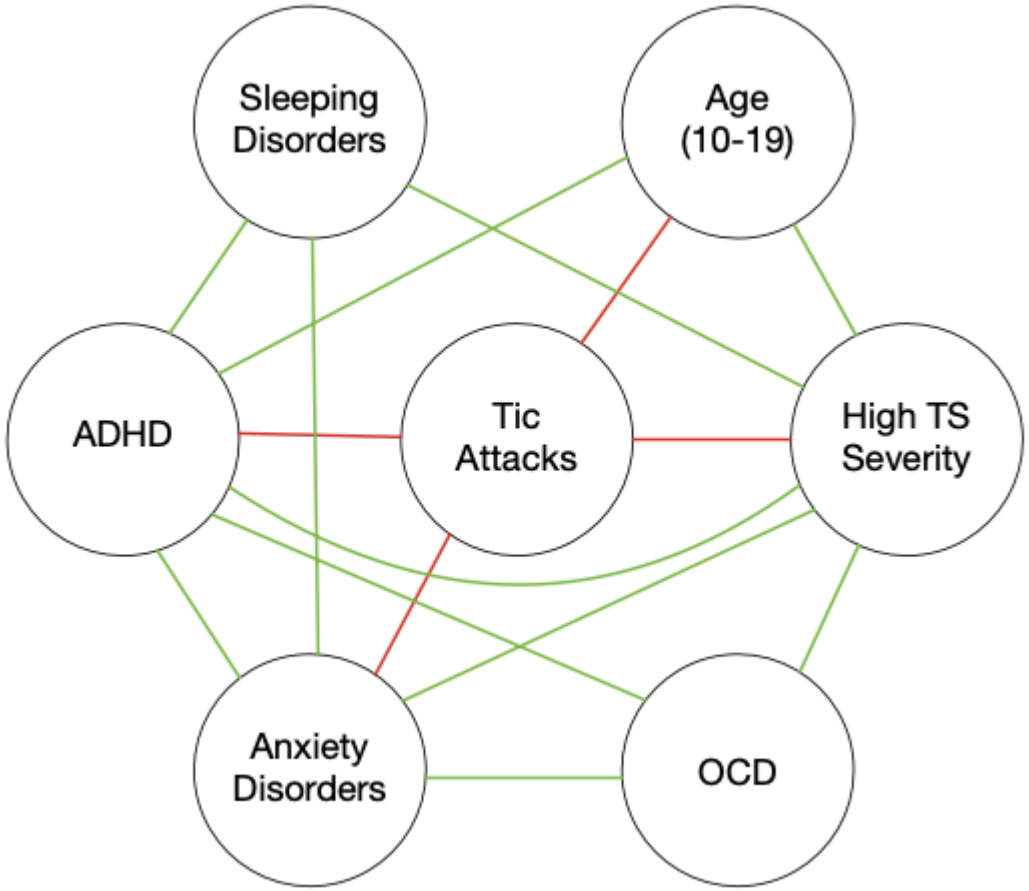
Age

- TS often peaks between the ages of 10 and 12 years old (Bloch, 2009)
- Tic attacks were found to be far more likely in the 10-19 year old range
  - 72% of patients with tic attacks vs 41% of control TS patients (Collicott, 2013)
- Age is associated with ADHD, the comorbidity most heavily associated with TS
  - According to the APA, 8.4% of children and 2.5% of adults have ADHD (Danielson, 2018; Simon, et al., 2009)
- Youths with TS often experience additional stress caused by bullying or heightened self-awareness of tics

Overall TS Severity

- Those with a higher overall severity of tics are more likely to experience tic attacks (46%) than those with a lower overall severity (15%)
  - Measured on YGTSS (31 v. 25) (Collicott, 2013)
- With a higher baseline tic activity, less additional factors may be necessary to experience a disabling bout of tics

Web of Comorbidities



04.
Conclusions:

Overall Results and Impact

What has been accomplished?

- Proposed a new diagnostic criteria for tic attacks that accounts for sensory phenomena and encompasses different presentations of disabling symptoms
  - Incorporated & adapted the YGTSS for diagnostic application
- Raised attention to temporary and fluid disabilities that occur for those with TS and tic attacks
- The interplay of various comorbidities on tic symptoms have been discussed, and examples of positive feedback loops have been suggested
- Implicated sleep disorders and OCD as comorbidities of TS worthy of further investigation in regards to tic attacks

How can this be applied?

- Application of proposed diagnostic framework by medical professionals and those in the TS community
  - Reduce invasive, expensive, and unnecessary measures for adolescents with TS who present with tic attacks at medical facilities
- Further disability advocacy and development of adaptable accommodations
- Treatment of tic attacks can utilize proposed mechanisms and interactions in tandem with existing treatment methods
- Initiate and support further research regarding tic attacks and the impact of associated comorbidities

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