The Anxiety-Tic Link: Anxiety and the Neurobehavioral Model of Tics

Presented By:
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Disclosures

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Learning Objectives

1. To understand how Anxiety in Tic Disorders affects function and quality of life in individuals
2. To be able to describe the relationship between tics and Anxiety
3. To understand how Anxiety symptoms may interact with the neurobehavioral model of tics
Why Focus on Anxiety?

Anxiety Disorders are common in TD

Anxiety may start early and persist in TD

Anxiety symptoms negatively impact youth with TD

Anxiety symptoms and tics interact
Anxiety symptoms matter to patients and families affected by tic disorders

Perceptions of treatment for tics among young people with Tourette syndrome and their parents: a mixed methods study

José Cuenca¹, Cris Glazebrook¹, Tim Kendall², Tammy Hedderly³, Isobel Heyman⁴, Georgina Jackson⁵, Tara Murphy⁶, Hugh Rickards⁷, Mary Robertson⁷, Jeremy Stern⁷, Penny Traynor⁸ and Chris Hollis¹

- Children with TS identified that worries had an impact on their tics
- For parents, the ability to manage or reduce negative emotions associated with tics was the second most desired outcome of treatment (~22%)
Anxiety May Start Early in TD

Hirschtritt et al., JAMA Psychiatry 2015
Anxiety and Quality of Life Are Related

Vermilion et al. 2020

+ Anxiety associated with psychosocial quality of life (n=185)

+ Anxiety symptom severity not associated with lower family impact score (n=193)
Anxiety in Tic Disorder: What Do We Need To Know?

+ What is the phenotype of anxiety symptoms and Anxiety Disorders in youth with TD?
+ How does anxiety affect function in youth with TD?
+ How do anxiety and tics interact?
+ How can we best manage symptoms in anxious youth with tics?
## Anxiety in Tic Disorders

<table>
<thead>
<tr>
<th>Composite ADIS Data</th>
<th>N=33</th>
</tr>
</thead>
<tbody>
<tr>
<td>No anxiety disorder</td>
<td>n=7  (21.2%)</td>
</tr>
<tr>
<td>Separation Anxiety Disorder</td>
<td>n=3  (9.1%)</td>
</tr>
<tr>
<td>Social Phobia</td>
<td>n=9  (27.3%)</td>
</tr>
<tr>
<td>GAD</td>
<td>n=20 (60.1%)</td>
</tr>
<tr>
<td>Specific phobia</td>
<td>n=15 (45.5%)</td>
</tr>
<tr>
<td>Panic disorder</td>
<td>n=4  (12.1%)</td>
</tr>
<tr>
<td>*At least 1 anxiety disorder</td>
<td>N=26 (78.8%)</td>
</tr>
</tbody>
</table>

**Unpublished data**

**Clinical Significance**
## Anxiety in CTD Interferes with Function

<table>
<thead>
<tr>
<th>Most Common Anxiety Symptoms</th>
<th>Number of Participants (n=53)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling overwhelmed</td>
<td>46 (86.7%)</td>
</tr>
<tr>
<td>Causes irritability</td>
<td>38 (72.7%)</td>
</tr>
<tr>
<td>Difficulty concentrating in class</td>
<td>37 (69.8%)</td>
</tr>
</tbody>
</table>

Only 9.4% of parents reported that anxiety does not affect school and only 5.7% reported that anxiety does not affect the family.

Unpublished data
# Severity of Interference from Anxiety in Daily Life

<table>
<thead>
<tr>
<th>Family Effect</th>
<th>Number of Participants (n=33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>8 (24.2%)</td>
</tr>
<tr>
<td>Minimal</td>
<td>7 (21.2%)</td>
</tr>
<tr>
<td>Mild</td>
<td>4 (12.1%)</td>
</tr>
<tr>
<td>Moderate</td>
<td>9 (27.3%)</td>
</tr>
<tr>
<td>Severe</td>
<td>4 (12.1%)</td>
</tr>
<tr>
<td>Extreme</td>
<td>1 (3.0%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outside Home Effect</th>
<th>Number of Participants (n=33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>10 (30.3%)</td>
</tr>
<tr>
<td>Minimal</td>
<td>3 (9.1%)</td>
</tr>
<tr>
<td>Mild</td>
<td>9 (27.3%)</td>
</tr>
<tr>
<td>Moderate</td>
<td>9 (27.3%)</td>
</tr>
<tr>
<td>Extreme</td>
<td>2 (6.1%)</td>
</tr>
<tr>
<td>Severe</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

Unpublished data
Functional Impact of Anxiety in Tic Disorders

Unpublished data

**Tic Severity in Those With and Without an Anxiety Diagnosis**

- No Anxiety Diagnosis
- Anxiety Diagnosis

**Global Functioning in Those With and Without an Anxiety Diagnosis**

- No Anxiety Diagnosis
- Anxiety Diagnosis

\[ P = 0.0001 \]

\[ P = 0.017 \]
Specific Anxiety Disorders are Related to Worse Tic Severity

- Social Phobia: $P = 0.0076$
- No Social Phobia
- GAD: $P = 0.0011$
- No GAD

Unpublished data
Treatment of Anxiety in Children with CTD

Mild to Moderate Anxiety:
Psychotherapy
Cognitive Behavioral Therapy (CBT)

Moderate to Severe Anxiety:
Medications +/- CBT
Data on Treatment of Anxiety in children with CTD

Anxiety in CTD Treatment

- No Medication or Therapy
- Just Medication
- Just Therapy
- Both Medication and Therapy

n=53

Unpublished data
Improvement with Treatment of Anxiety in Youth with CTD

Improvement with Medications

- No Improvement
- Mild Improvement
- Significant Improvement

n=26

Improvement with Therapy

- No Improvement
- Mild Improvement
- Significant Improvement

n=47

Unpublished data
# Barriers to Treatment

<table>
<thead>
<tr>
<th>Reason for not trying a medication</th>
<th>Number of participants (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wanting to try therapy first</td>
<td>16 (59.3%)</td>
</tr>
<tr>
<td>Concerns about side effects</td>
<td>15 (55.6%)</td>
</tr>
<tr>
<td>Symptoms not severe enough</td>
<td>8 (29.6%)</td>
</tr>
<tr>
<td>Medication never mentioned by provider</td>
<td>3 (11.1%)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (11.1%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Barriers to Counseling</th>
<th>Number of participants (n=21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty getting an appointment</td>
<td>12 (57.1%)</td>
</tr>
<tr>
<td>Insurance does not cover it</td>
<td>13 (61.9%)</td>
</tr>
<tr>
<td>Child has difficulty talking with strangers</td>
<td>5 (23.8%)</td>
</tr>
<tr>
<td>Services are not offered in the area</td>
<td>2 (9.5%)</td>
</tr>
<tr>
<td>Other</td>
<td>9 (42.9%)</td>
</tr>
</tbody>
</table>
Anxiety Treatment: Impact on Tics

- Clinically, we often target anxiety first in tic disorders
- But no data on the impact of anxiety treatment on tics
- Does anxiety treatment improve tics?
Is the Anxiety-Tic relationship direct?
Is it an indirect relationship?

Anxiety

Tics

Function

The roles of anxiety and depression in connecting tic severity and functional impairment

Adam B. Lewin a,⁎, Eric A. Storch a, Christine A. Conelea b, Douglas W. Woods b, Samuel H. Zinner c, Cathy L. Budman d, Lawrence D. Scahill e, Scott N. Compton f, John T. Walkup g, Tanya K. Murphy a
Neurobehavioral Model of Tics: The Premonitory Urge
Neurobehavioral Model of Tics: Basis for Behavior Therapy

- Habit Reversal Therapy
  - Recognize premonitory urge
  - Develop a Competing Response
  - Break the urge-tic relationship
- Proposed Neurobiology
  - Competing motor patterns in basal ganglia
  - Basal ganglia able to better inhibit undesirable motor outputs (tics)
Data on relationship between urge severity and tic severity are mixed.

Negative emotional consequence of urge may be related to amygdala activation (Wang et al., Am J Psych, 2011).

Anxiety symptom severity may be associated with urge severity (Rozenman et al., Child Health Care 2015).

Relationship may be more robust in those with low distress tolerance (Ramsey et al., Child Psych & Hum Develop, 2021).
Neural Circuitry Supports Anxiety-Tic Relationship

+ There are multiple connections within and between neural circuits (Fox 2018)
+ Cortical and subcortical circuits underlying mood and movement disorders are complex: **Parallel, Serial, Interactive**
Parallel Circuits

Cerebral cortical mechanisms initiate thoughts, emotions, and behaviors.

Basal ganglia circuits act in parallel to allow the desired behavior or thought to proceed (selective facilitation) and to inhibit competing behaviors or thoughts from interfering with the desired one (surround inhibition).

Mink, *Fundamental Neuroscience*, 2012
Integration Across Subcortical Circuits - Directionality

Haber et al., 2000
Circuit Implications for Disorders

+ Optimal function requires:
  - Selection of wanted, and inhibition of competing behaviors, thoughts, movements
  - Parallel simultaneous processing is required
  - Serial processing in required
  - Communication and integration across circuits
Mood and movement disorders share overlapping circuits. Mood and movement disorders share features of impaired selection and inhibition of competing thoughts/behaviors/movements. Knowledge of the circuitry can inform design and testing of treatment approaches targeting multiple symptoms.

Godar and Bortolato, Neurosci Biobehav Rev, 2017
Anxiety in TD is common and functionally impairing.

Anxiety disorders are associated with higher tic severity in youth with TD.

Anxiety likely interacts with the premonitory urge to impact the neurobehavioral model of tics.

Treatment of anxiety has the potential to improve tics in TD.
Acknowledgements

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+ Patients and subjects

+ TAA