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

Presented By:

Jennifer Vermilion, MD

Yelizaveta Sapozhnikov, BS

Disclosures

AAN, ABF, TAA, Clinical Research Training Scholarship in Tourette Syndrome (Vermilion)

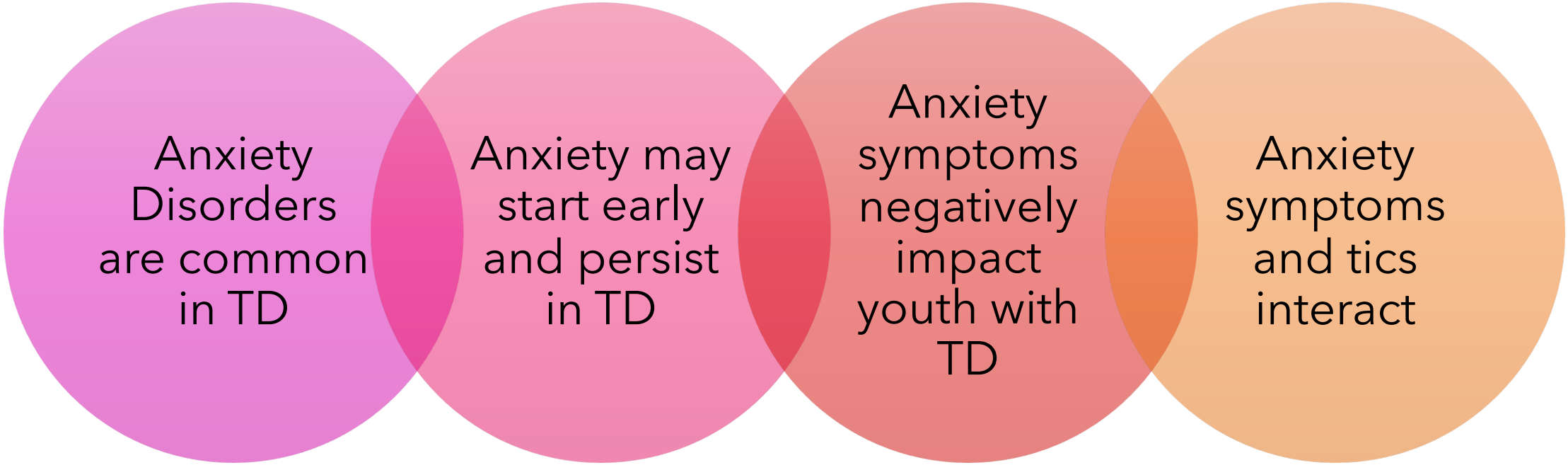
Centers for Disease Control and Prevention: Prevention Research Center Special Interest Project (Vermilion)

Year Out Research Funding by the University of Rochester Office of Medical Education (Sapozhnikov)

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 symptoms matter to patients and families affected by tic disorders

RESEARCH ARTICLE Open Access

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

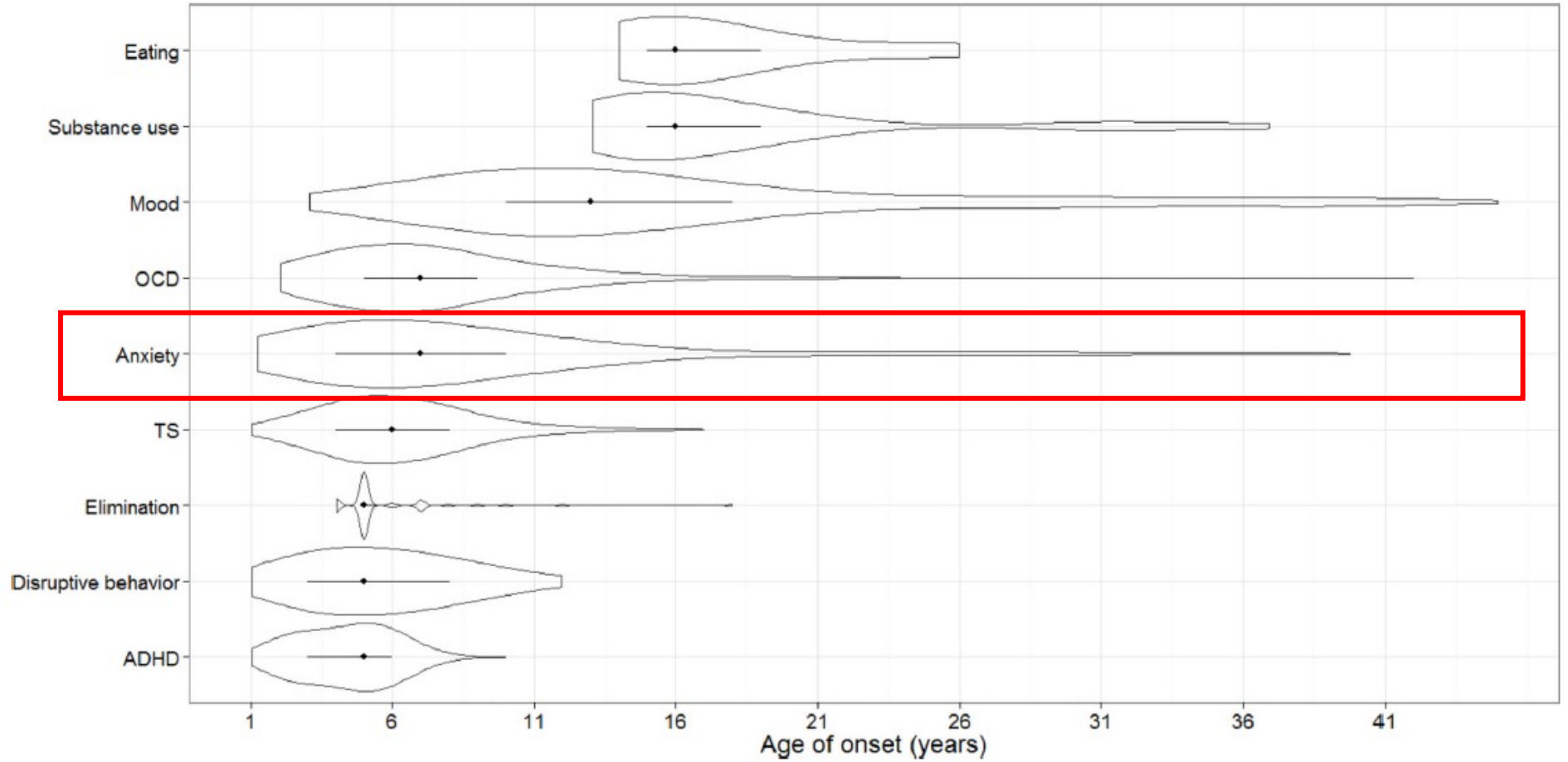
José Cuenca[1], Cris Glazebrook[1*], Tim Kendall[2], Tammy Hedderly[3], Isobel Heyman[4], Georgina Jackson[1], Tara Murphy[5], Hugh Rickards[6], Mary Robertson[7], Jeremy Stern[7], Penny Trayner[8] and Chris Hollis[1]

Online survey of parents of youth with TS — N=295

In-depth interviews of youth with TS — N=42

- 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

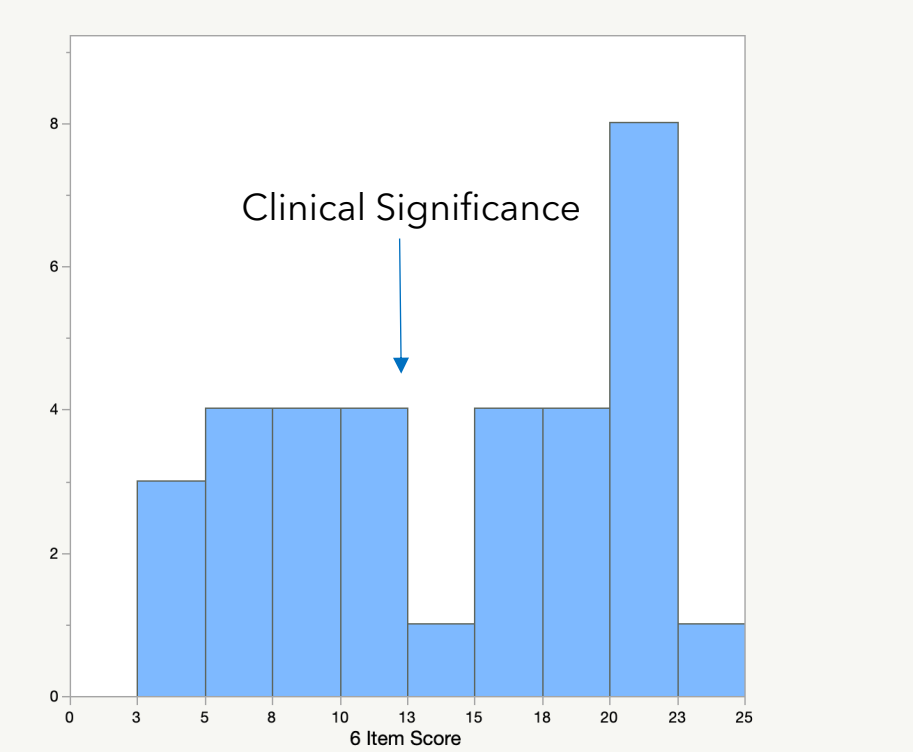
- •Anxiety associated with psychosocial quality of life (n=185)
- •Anxiety symptom severity not associated with lower family impact score (n=193)

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

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



Unpublished data

Anxiety in CTD Interferes with Function

Most Common Anxiety Symptoms	Number of Participants (n=53)
Feeling overwhelmed	46 (86.7%)
Causes irritability	38 (72.7%)
Difficulty concentrating in class	37 (69.8%)

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

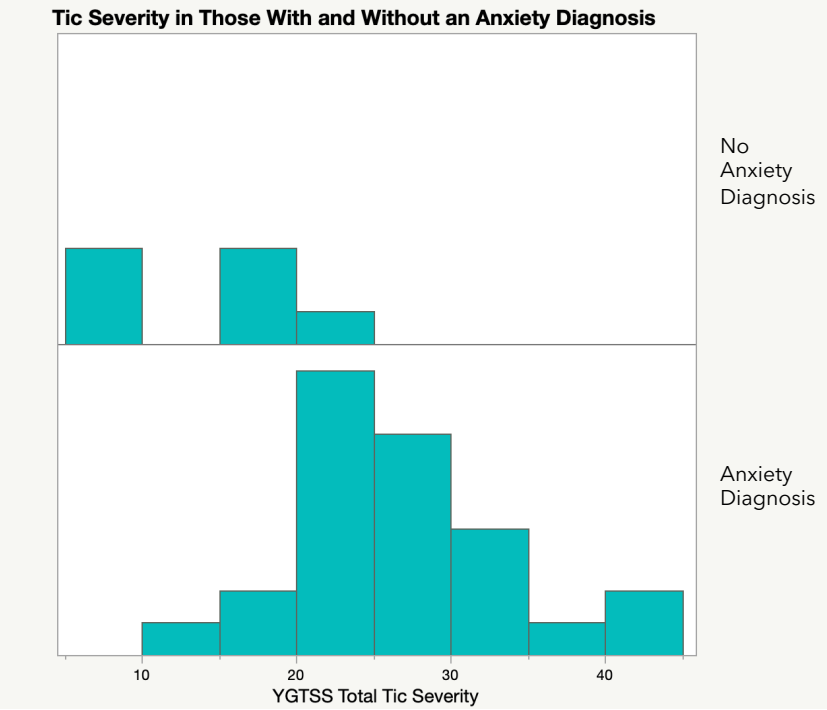
Severity of Interference from Anxiety in Daily Life

Family Effect	Number of Participants (n=33)
None	8 (24.2%)
Minimal	7 (21.2%)
Mild	4 (12.1%)
Moderate	9 (27.3%)
Severe	4 (12.1%)
Extreme	1 (3.0%)

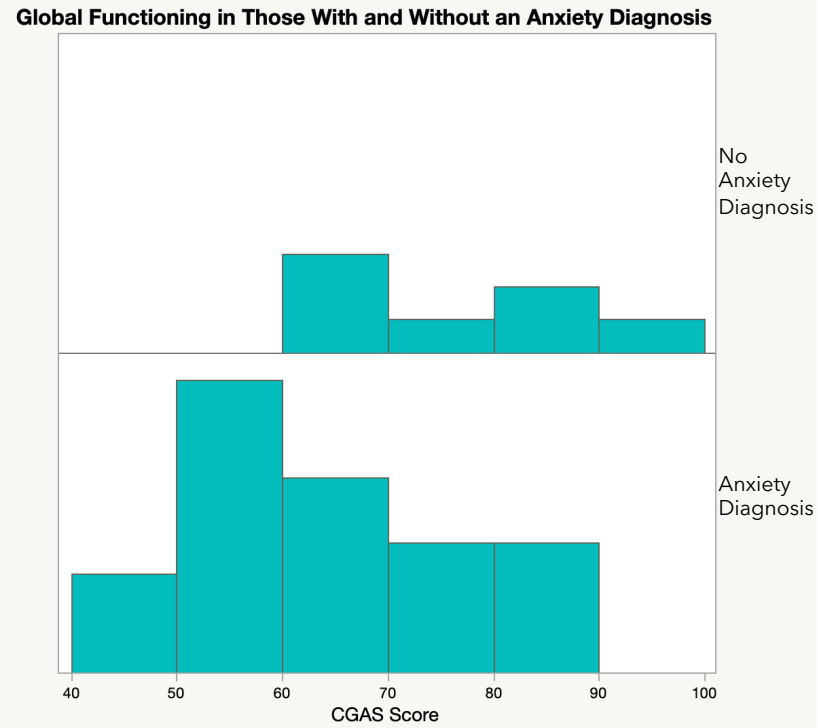
Outside Home Effect	Number of Participants (n=33)
None	10 (30.3%)
Minimal	3 (9.1%)
Mild	9 (27.3%)
Moderate	9 (27.3%)
Extreme	2 (6.1%)
Severe	0 (0%)

Unpublished data

Functional Impact of Anxiety in Tic Disorders



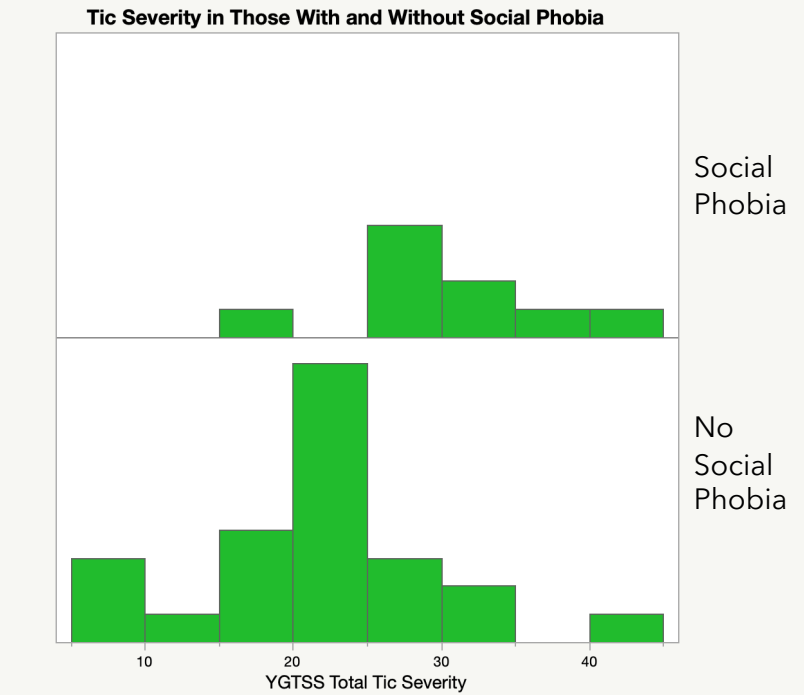
P = 0.0001



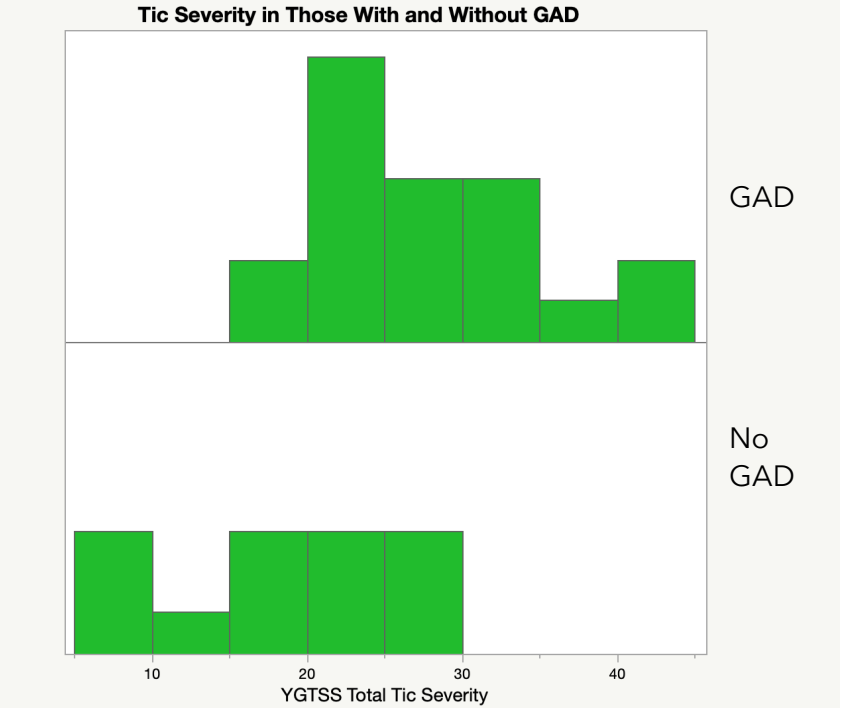
P = 0.017

Unpublished data

Specific Anxiety Disorders are Related to Worse Tic Severity



P = 0.0076



P = 0.0011

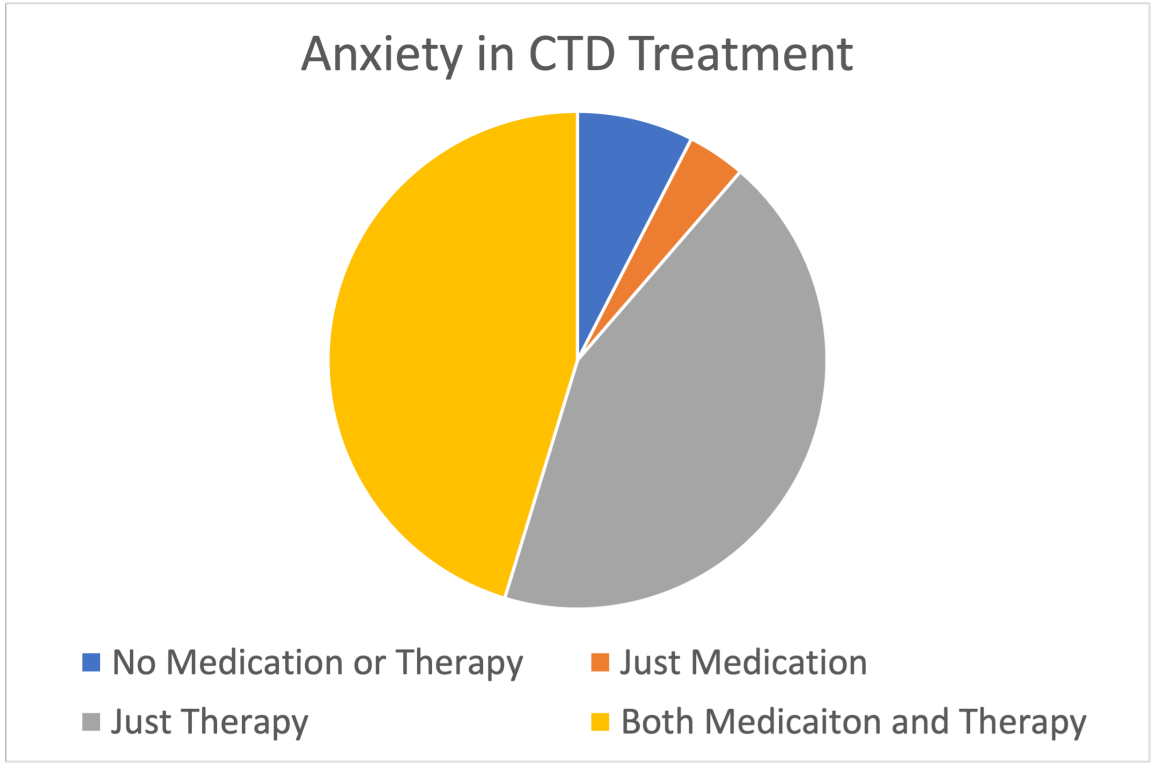
Unpublished data

Treatment of Anxiety in Children with CTD

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

Moderate to Severe Anxiety:
Medications +/- CBT

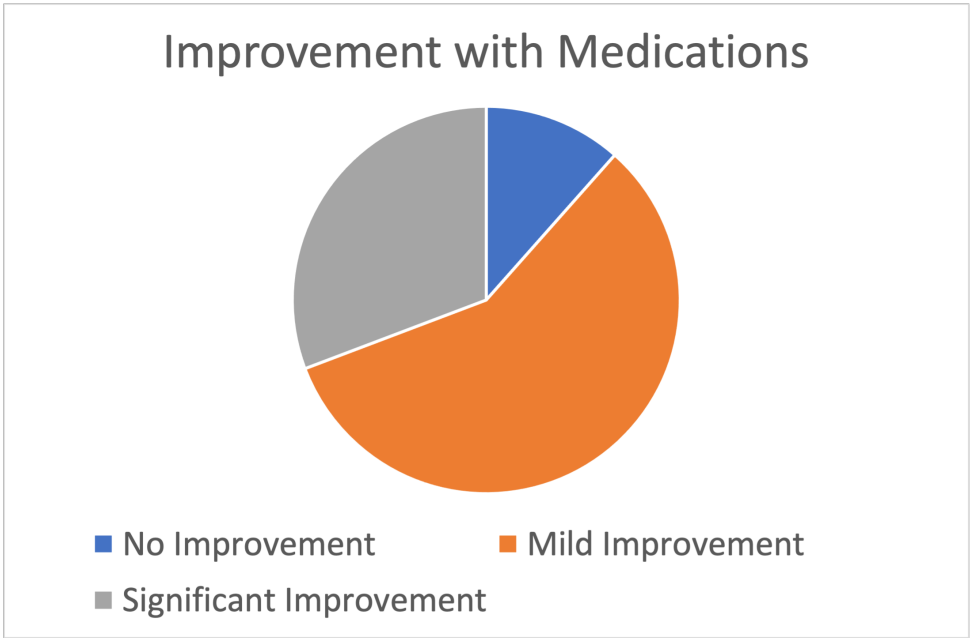
Data on Treatment of Anxiety in children with CTD



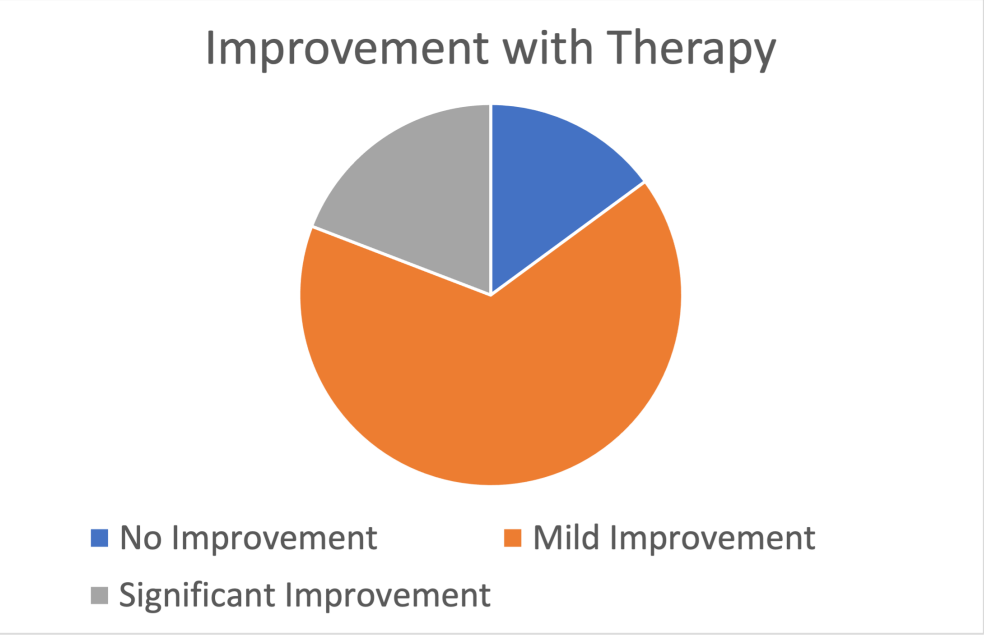
n=53

Unpublished data

Improvement with Treatment of Anxiety in Youth with CTD



n=26



n=47

Unpublished data

Barriers to Treatment

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

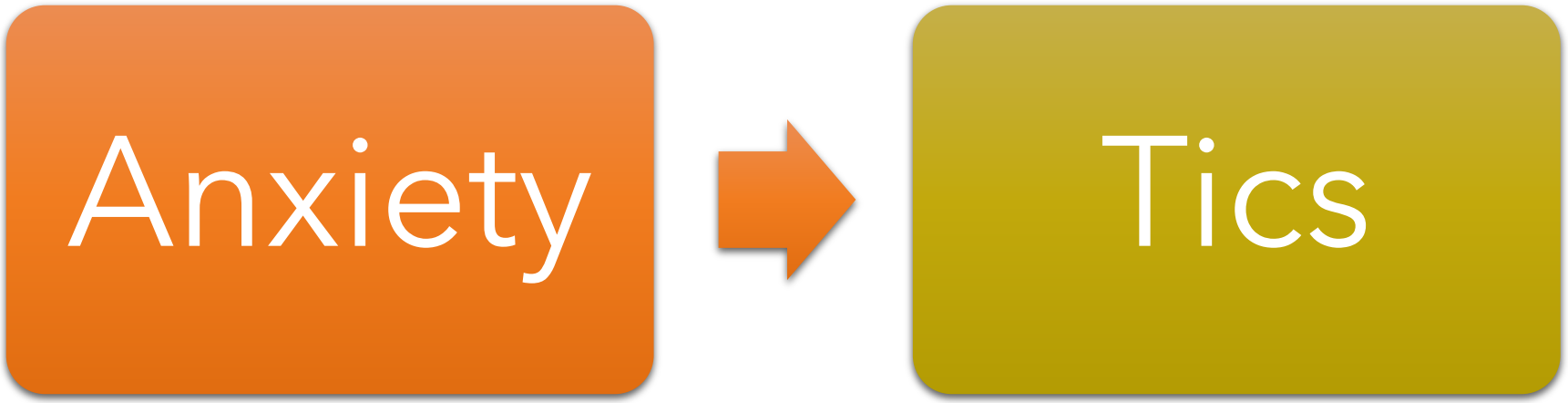
Barriers to Counseling	Number of participants (n=21)
Difficulty getting an appointment	12 (57.1%)
Insurance does not cover it	13 (61.9%)
Child has difficulty talking with strangers	5 (23.8%)
Services are not offered in the area	2 (9.5%)
Other	9 (42.9%)

Unpublished data

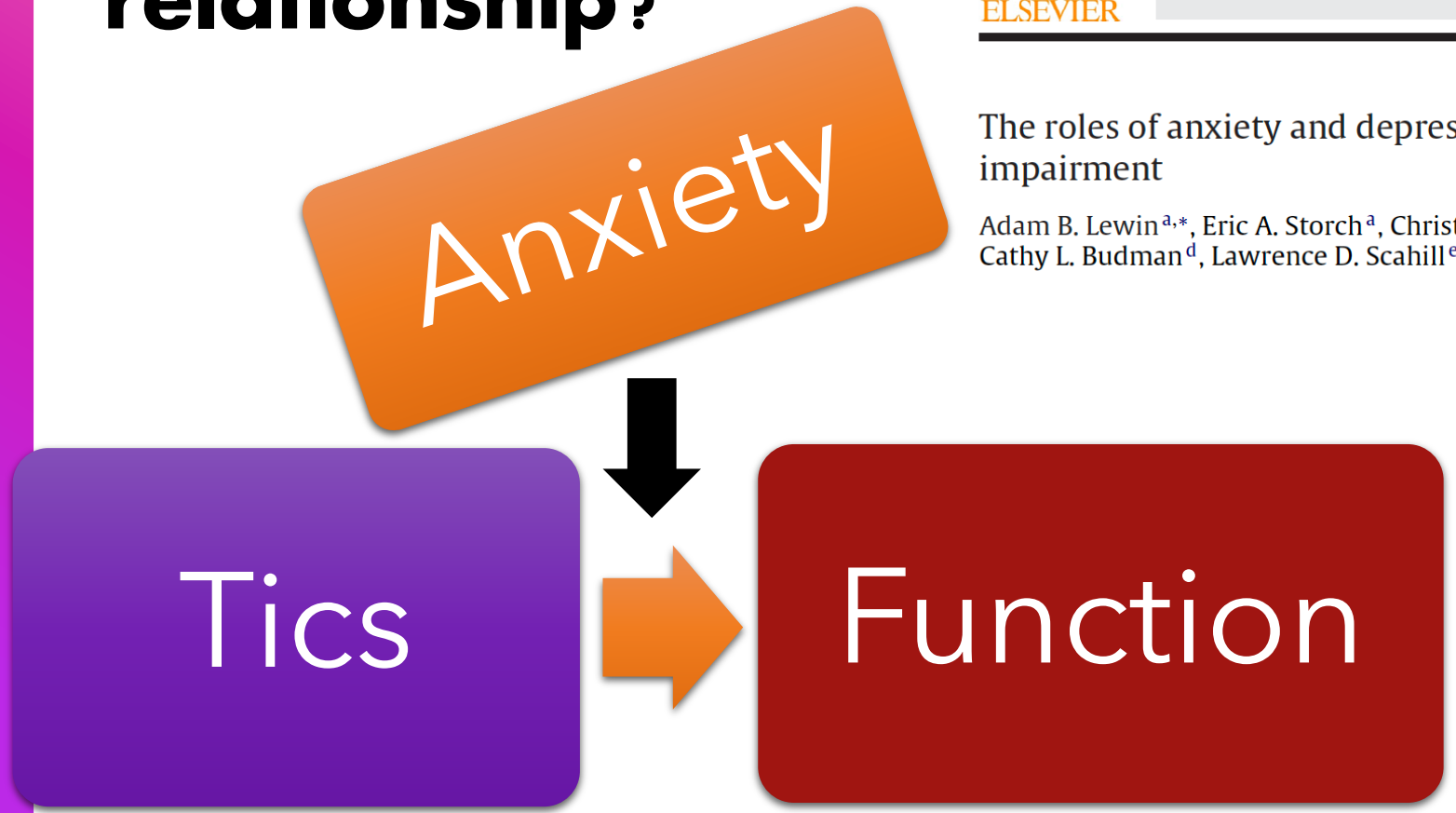
Anxiety Treatment: Impact on Tics

- 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?



Journal of Anxiety Disorders 25 (2011) 164–168

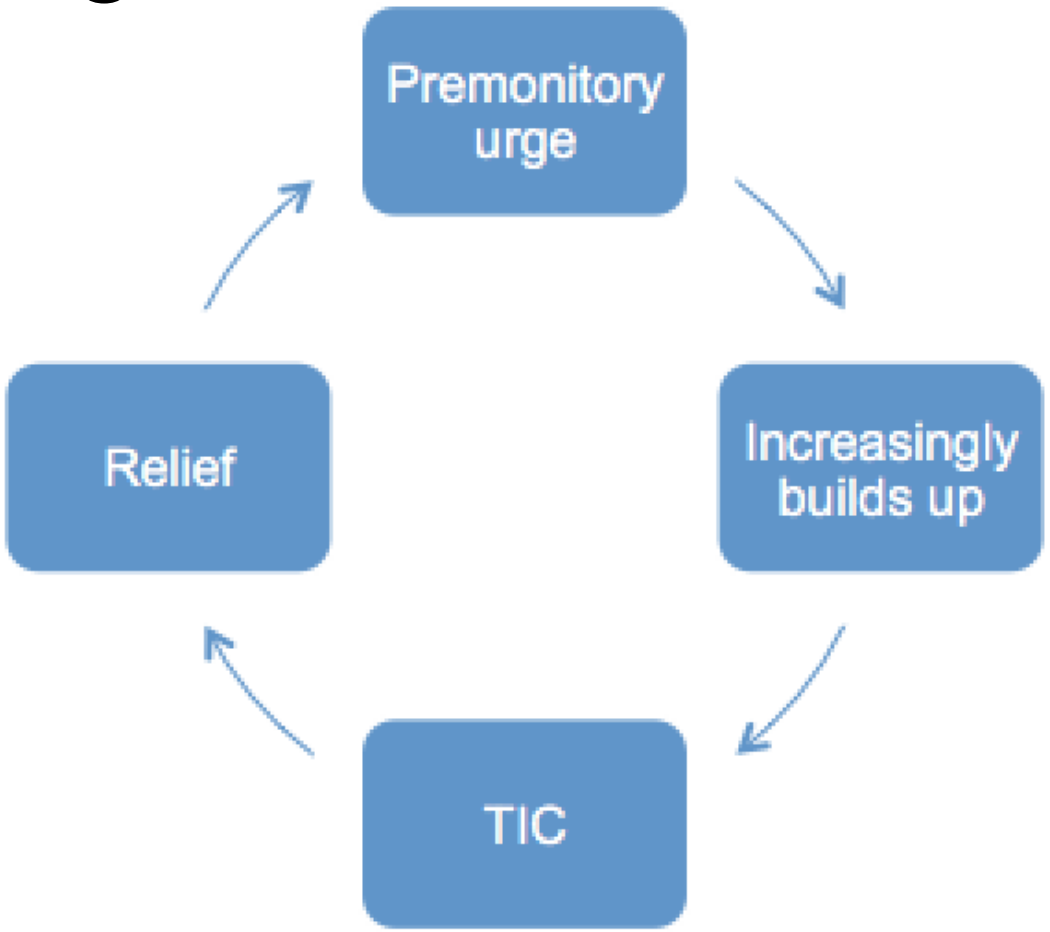
Contents lists available at ScienceDirect

Journal of Anxiety Disorders

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

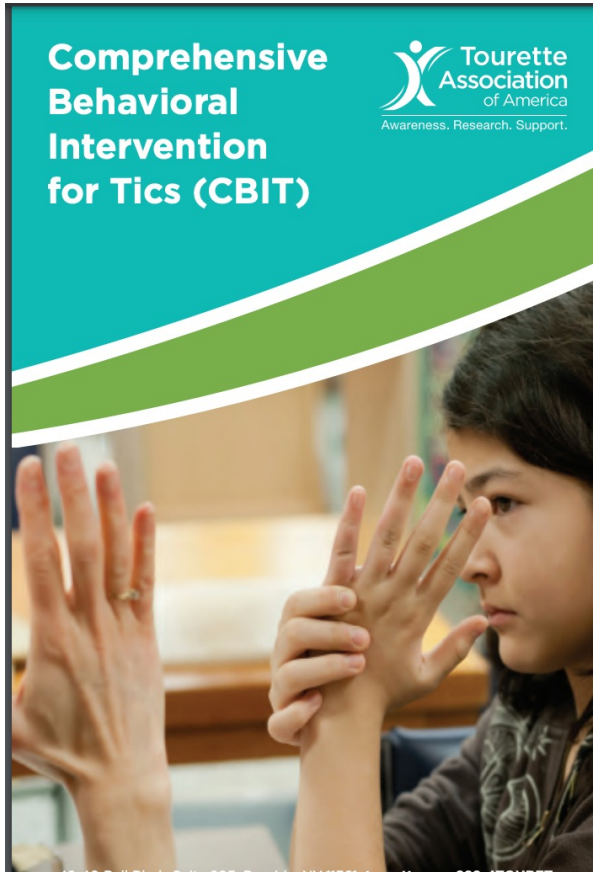
Adam B. Lewin[a,*], Eric A. Storch[a], Christine A. Conelea[b], Douglas W. Woods[b], Samuel H. Zinner[c], Cathy L. Budman[d], Lawrence D. Scahill[e], Scott N. Compton[f], John T. Walkup[g], Tanya K. Murphy[a]

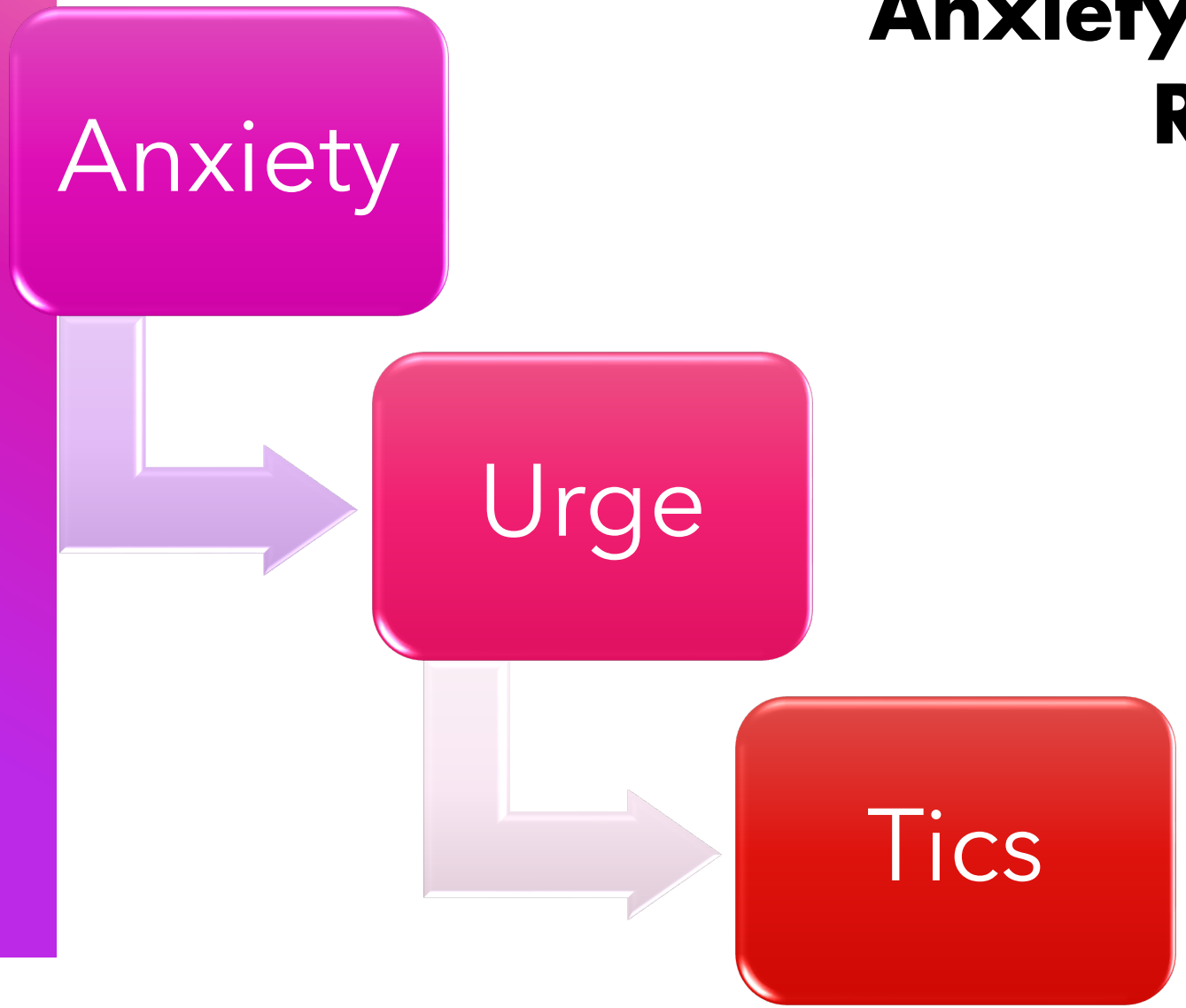
Neurobehavioral Model of Tics: The Premonitory Urge



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)





Anxiety Impact on Urge-Tic Relationship?

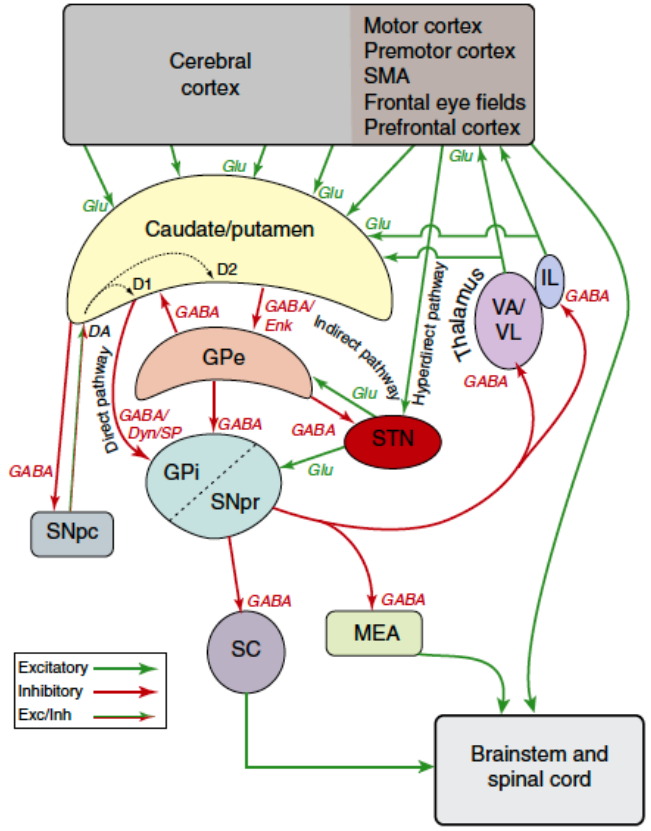
- Data on relationship between urge severity and tic severity are mixed
- Negative emotional consequence of urge may be related to amygdala activation (Wang et al., *Am J Psych,* 2011)
- Anxiety symptom severity may be associated with urge severity (Rozenman et al., *Child Health Care* 2015)
- Relationship may be more robust in those with low distress tolerance (Ramsey et al., *Child Psych & Hum Develop*, 2021)

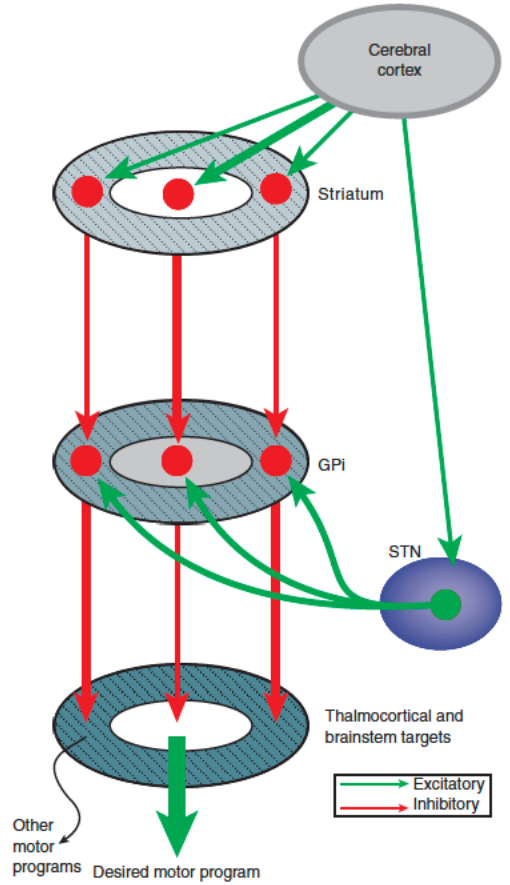
Neural Circuitry Supports Anxiety-Tic Relationship

- 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

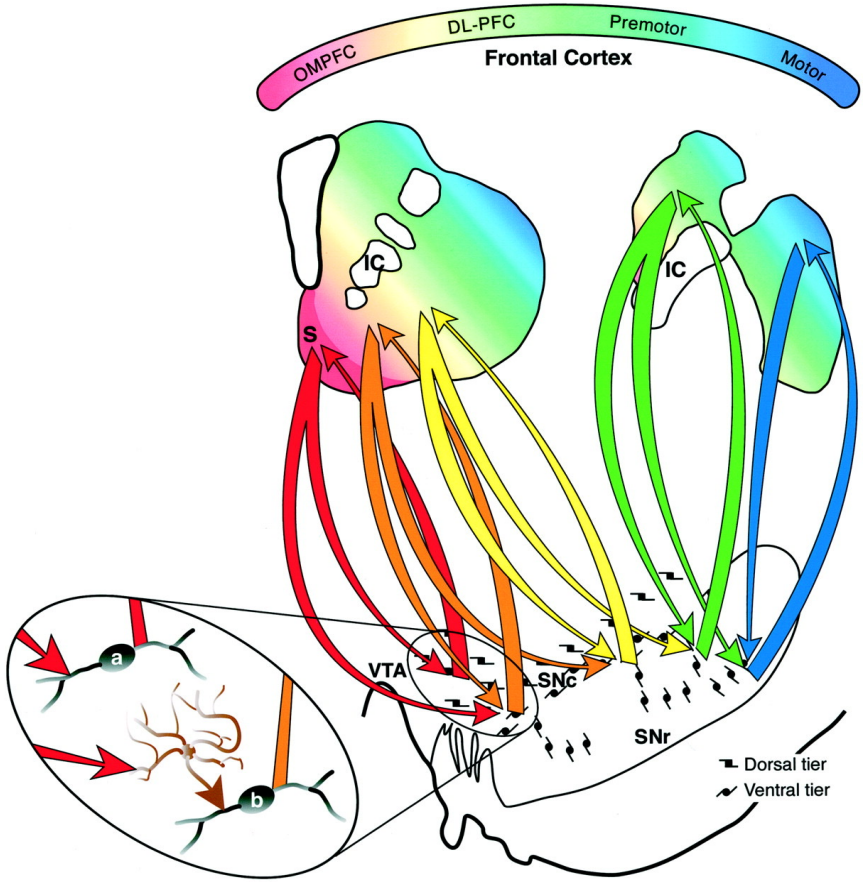
- Cerebral cortical mechanisms initiate thoughts, emotions, and behaviors
- Basal ganglia circuits act in parallel to allow the desired behavior or thought to proceed (selective facilitation) and to inhibit competing behaviors or thoughts from interfering with the desired one (surround inhibition)

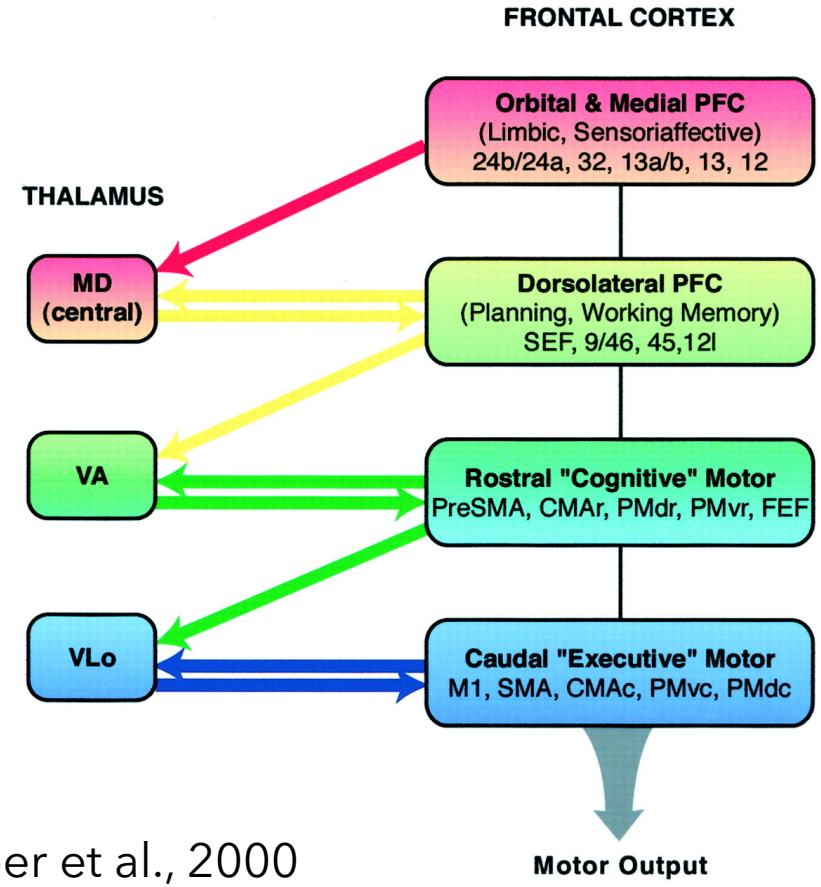




Mink, *Fundamental Neuroscience*, 2012

Integration Across Subcortical Circuits - Directionality





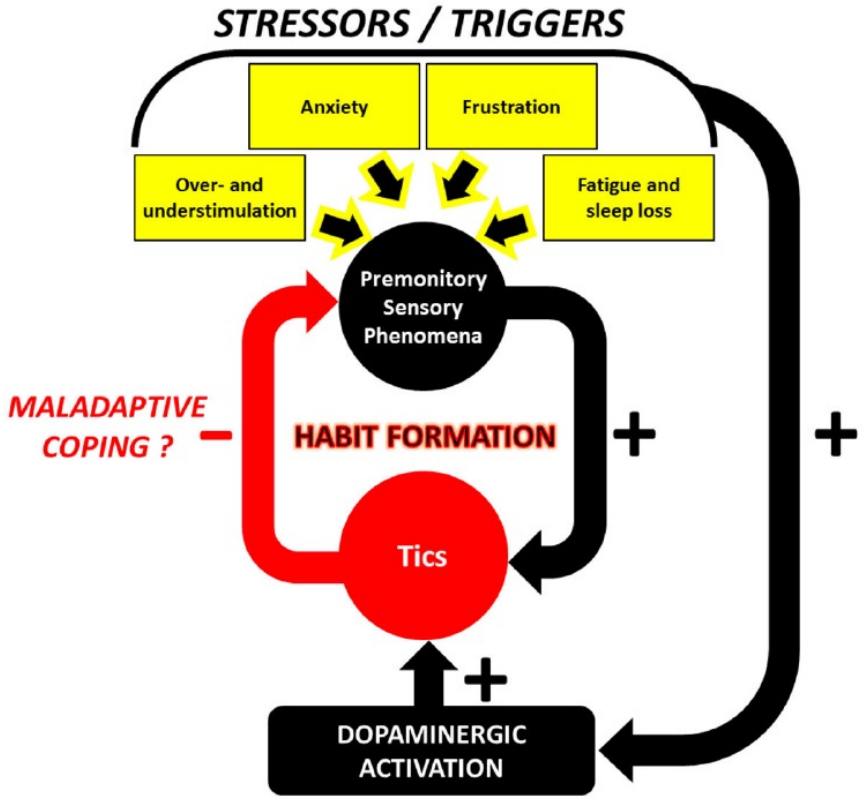
Haber et al., 2000

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

Motor and Mood Circuits: Implications for Treatment

- 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

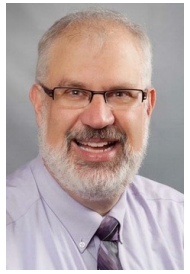
Summary

- 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

+ Mentors

Jonathan Mink, MD PhD



Erika Augustine MD MS

Heather Adams PhD

+ Funding

Clinical Research Training Scholarship in Tourette Syndrome through the TAA, ABF, AAN

U01 DD000510/DD/NCBDD CDC HHS/United States

U01 DD000509/DD/NCBDD CDC HHS/United States

T32 NS007338/NS/NINDS NIH HHS/United States

+ Patients and subjects

+ TAA