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BACKGROUND

- From 2020-2022, coinciding with the COVID pandemic, a well documented influx of adolescents presented worldwide with acute onset of functional tic-like behaviors (FTLB)¹
- Increased rates of anxiety, depression, and social isolation, which were prevalent during shutdown, are considered to be driving factors of FTLB²
- FTLB during COVID also correlated with high rates of social media use that created a sense of community for isolated teens, including sites with tic-related content or influencers with FTLB. Many patients' FTLB mimicked symptoms similar to those seen online, in a phenomenon that came to be known as "TikTok tics", also called a "pandemic within a pandemic"³⁻⁴

Classic Tics	Functional Tic-Like Behaviors
Present over a longer span of time (1+ years)	Occur in rapid succession over a short span of time
Age of onset in early childhood	Age of onset 12 and 18 year old
Presence of premonitory urge to tic	Lack of premonitory urge
Simple or complex tic-like behaviors that are stereotyped	Multiple varying complex movements like hitting oneself, whistling, lip popping, or repeating random words

OBJECTIVES

- To better understand the outcomes of FTLB in children
- Describe the percentage of patients that have experienced a resolution of their symptoms since COVID-19 pandemic isolation protocols have been lifted
- Identify comorbidities that may foster a higher risk of developing FTD and determine effective treatments

METHODS

SAMPLE

- 56 children aged 10 to 18 years old seen at BCH psychiatry or neurology outpatient clinics between 08/2020 and 12/2022

INSTRUMENTS

- Clinical Global Impression Improvement Scale (CGI-I) (for FTLB)
- Clinical Global Impression Severity Scale (CGI-S) (overall functioning)

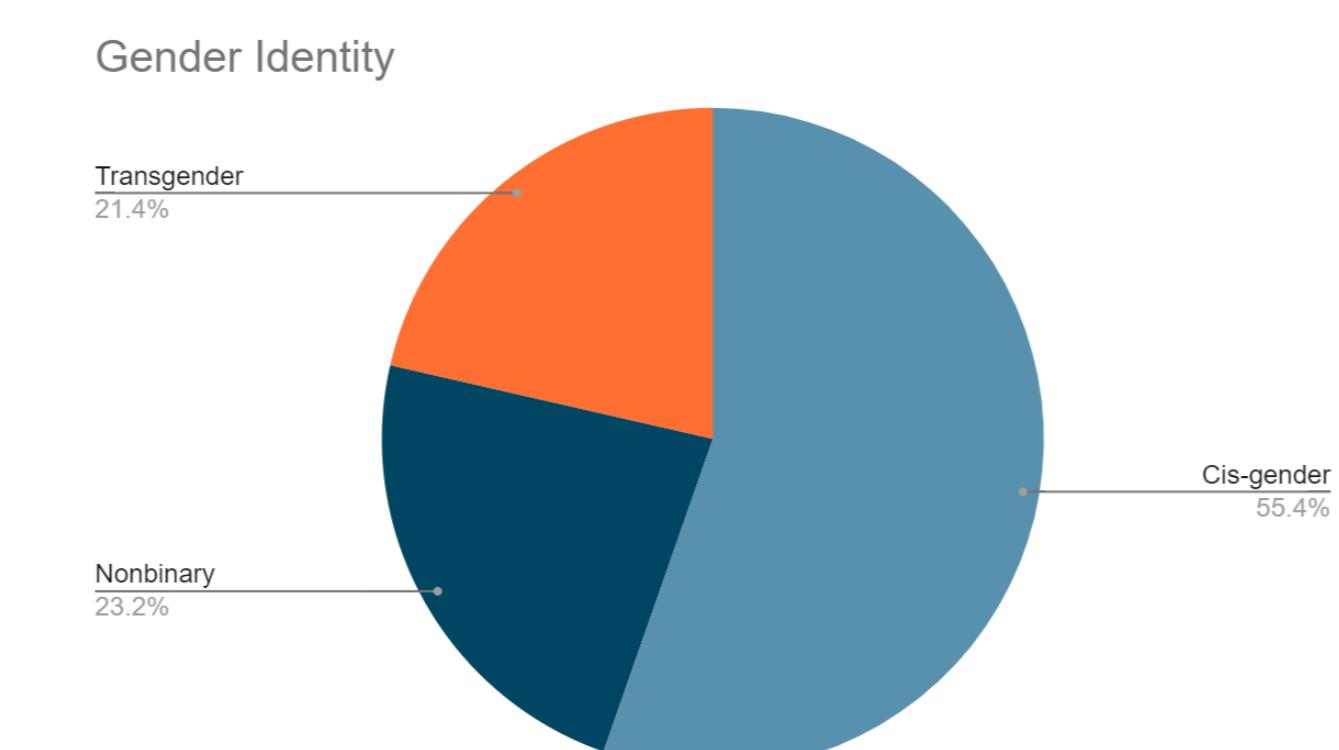
CLINICAL EVALUATION

- A retrospective chart review of pharmacologic treatments (including SSRIs, antipsychotics, alpha agonists), and various behavioral therapies was done along with a review of symptomatology

RESULTS

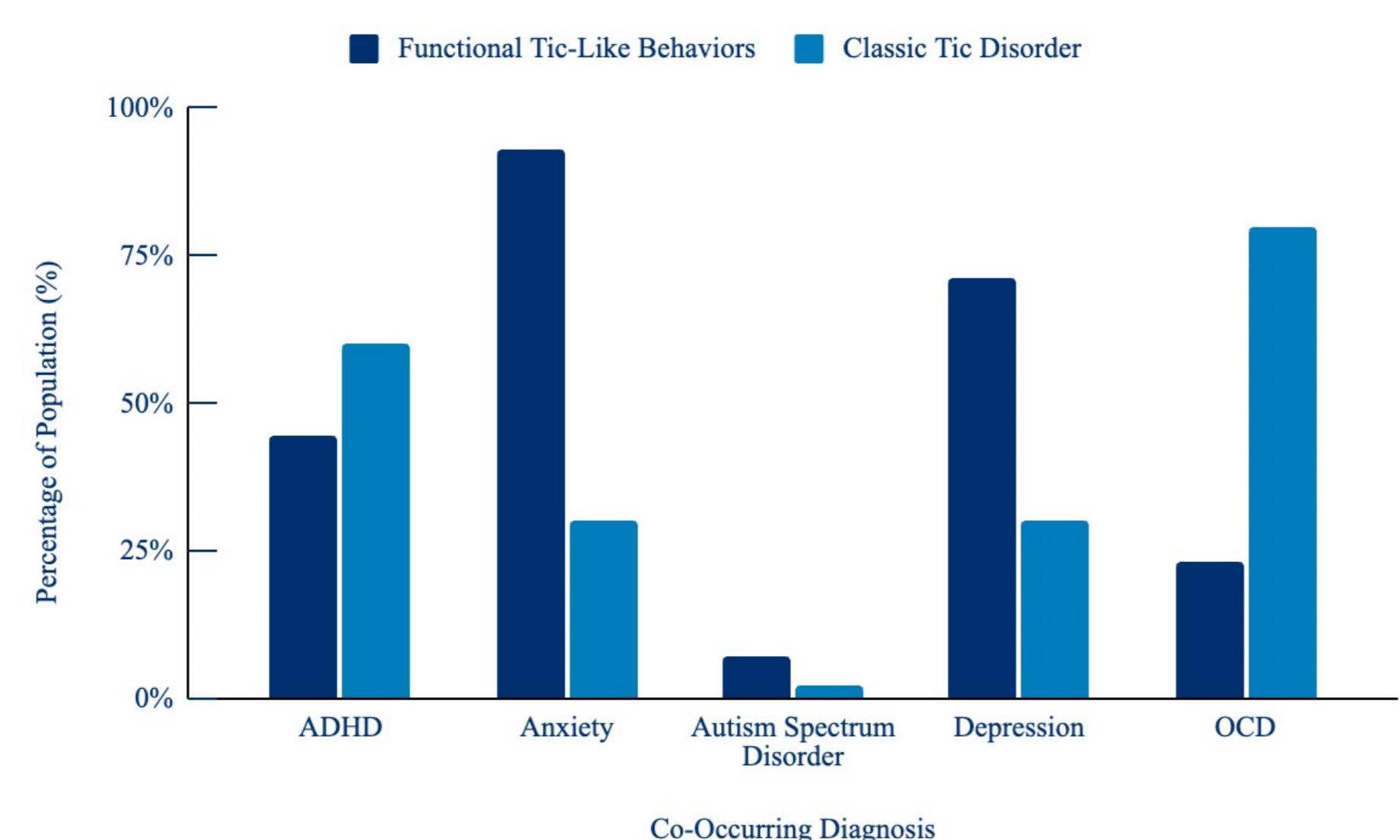
- The majority of patients (96%) were females assigned at birth; 45% identified as gender diverse.
- Typical age of onset was 14 years old, significantly higher than that of classic tic disorders. Fewer than 1/3 of patients (32.1%) had a history of prior tics

Figure 1. Gender diversity in our cohort



- 45% patients had ADHD and 7% had autism. Most patients had preceding mental health struggles, including 93% with anxiety disorders and 71% with depressive disorders.

Figure 2. Comparison between comorbid conditions in FTLB and tics



Compared to adolescents with classic tic disorder, those in our cohort with FTLBs reported having higher rates of co-morbid anxiety (93% vs 30%) and depression (71% vs 30%). Presentation of co-morbid OCD and ADHD, in contrast, is more common in adolescents with classic tic disorders than FTLBs (OCD=80% vs. 23%; ADHD=60% vs. 45%). ASD appears to be slightly more prevalent in those with FTLBs (7% vs 2%), though our number of adolescents with ASD is small, making it difficult to draw reliable comparisons (Zohar 1992, Ogundele, 2018, Freeman, 2000).

- On CGI-I scores, 79% of patients showed improvement in FTLB at follow-up. In terms of overall function, clinicians rated most patients as normal to mildly ill (71.4%) at follow-up; a subset developed other functional neurologic disorders (FND).
- With regard to overall functioning, gender-diverse patients were significantly more likely to be rated as moderately to extremely ill at follow up ($P < 0.05$). However, while, overall functioning varied differed by gender identity, tic- improvement did not.
- The majority of patients demonstrated improvement in tic-like behaviors at follow up, regardless of gender identity.

Table 1. CGI-I and CGI-S Outcome by gender identity

* $P<0.05$, ** $P<0.01$, *** $P<0.001$.

	Total #	CGI Improved		Chi-square
		Ci-s Gender	Gender Diverse	
CGI-I (Tic Improvement)				
Ci-s Gender	31	26	83.9%	1.2
Gender Diverse	25	18	72%	
CGI-S (Overall Functioning)				
Ci-s Gender	31	26	83.9%	5.3*
Gender Diverse	25	14	56%	

- 84% percent of our patients engaged in therapy and medication, and this combined approach yielded the most improvement, regardless of the type of therapy.

Table 2. Treatment Modalities Outcome

Table shows number of subjects improved based on treatment. * $P<0.05$, ** $P<0.01$, *** $P<0.001$

CGI Outcome	# Subjects	# CGI Improved	%	Chi-square
<i>Behavioral Therapy</i>				
Mental Health Therapy (with CBT)	19	15	78.9%	6.4*
Mental Health Therapy (without CBT)	29	23	79.3%	10.0**
<i>Medications</i>				
Mental Health Therapy with No SSRI/SSNRI	9	7	77.8%	4.5*
SSRIs/SSNRIs	46	35	76.1%	12.5***

CONCLUSION

Discussion:

- Increase in functional tics in adolescents during COVID-19 pandemic resolved for 79% of patients in our cohort.
- Clinical improvement in FTLB was independent of specific comorbidity or gender identity. Over 3/4 of patients improved regardless of other diagnoses
- Among those that have not improved there was often a progression to other impairments such as psychogenic non-epileptic seizures (PNES), or eating disorders
- Ongoing FTLB have often been seen in patients who feel validated by this diagnosis and align with active functional tic communities
- Approximately 1/3 of patients improved regardless of varying treatment combinations
- Further analysis is required to confirm if specific medication combinations or therapy modalities correlate with improvement in symptoms
- A modified comprehensive behavioral therapy for tics (CBIT) with comprehensive behavioral therapy (CBT) and sensory grounding warrants a development of a modified protocol for patients with FTLB.

Lessons learned:

- Patient's willingness to engage in therapy and commitment to practicing skills and shifting their mindset away from tics, regardless of the type of therapy seemed essential.
- We learned that social connectivity and spread of ideas among teens via social media has become a powerful, previously underestimated tool and we need to be cautious about future mass sociogenic illnesses.
- Even though for many patients FTLB have improved but anxiety driven illnesses including other FND presentations and eating disorders need to be monitored.
- The future research and recognition of contributing psychosocial factors will allow optimal support for these patients.

REFERENCES

- Heyman I, Liang H, Hedderly T. COVID-19 related increase in childhood tics and tic-like attacks. *Arch Dis Child* 2021; **106**: 420–421.
- Macchi ZA, Kletenik I, Olvera C, Holden SK. Psychiatric comorbidities in functional movement disorders: a retrospective cohort study. *Mov Disord Clin Pract* 2021; **8**(5): 725–732.
- Pringsheim T, Ganos C, McGuire JF, Hedderly T, Woods D, Gilbert DL, Piacentini J, Dale RC, Martino D. Rapid Onset Functional Tic-Like Behaviors in Young Females During the COVID-19 Pandemic. *Mov Disord*. 2021 Dec;36(12):2707-2713.
- Olvera C et al., TikTok Tics: A Pandemic within a Pandemic. *Mov Disord* 2021; **8**(8): 1200-1205.
- Pringsheim T, et al., European Society for the Study of Tourette Syndrome 2022 criteria for clinical diagnosis of functional tic-like behaviours: International consensus from experts in tic disorders, *Euro J of Neuro* 2023; **30**(4): 902-910.