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Behavioral, Clinical and Cognitive Predictors of Tic Suppression

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Premonitory Urge

Relationship between Premonitory Urge and Tic unclear

- Not all tics preceded by urges
 - Only 55% of tics in CBIT sample preceded by urge (McGuire et al., 2015)
- Correlation between urge and tic features inconsistent, especially in younger children
- No relationship between urge severity and potential for tic inhibition (Ganos et al., 2012)
- Different neural bases of tic reduction (left IFG; Ganos et al., 2014) and urge (insula; Tinaz et al., 2015)



Habituation as Mechanism

ADULTS

- Mean reduction in PU for CBIT responder group did not differ from that for other groups.
- Reduction in PU severity did not mediate response
- Similar findings for ERP

CHILDREN

- PU didn't change over time for either group nor responders or nonresponders, nor did it mediate treatment response
- PU reduction correlated with reduction in depressive symptoms and anxiety sensitivity

(Houghton et al, 2017; van de Griendt et al, 2023)



Interoceptive Awareness

- Our original model predicted that interoceptive awareness would predict HRT response
 - Comorbid Anxiety (increased awareness) – better outcome
 - Comorbid ADHD (decreased awareness) – worse outcome
- However across the child+adult CBIT studies, comorbid anxiety disorder predicted worse response and ADHD was not predictive at all.
- ADHD had to be under control (e.g., medicated) for study entry.



HRT Mechanism of Action

Is Attention directed **AWAY** from or **TOWARD** tics more effective for reducing tics?

- BT: awareness training and competing response generally associated with attention towards tics
- But patterned breathing is competing response for vocal tics and relaxation training is part of treatment protocol
 - Vocal tics more likely than motor tics (52% to 39%) to remit with CBIT (McGuire et al., 2016)
- Mindfulness-based treatments may show benefit (Gev et al., 2016; Reese et al, 2015)



Study Sample

Sample drawn from larger study characterizing neural oscillatory activity and effective connectivity, using a case–control design, among children with and without chronic tic disorder during performance of a cognitive inhibition task

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Study Aims

We utilized a behavioral suppression paradigm to:

- Characterize behavioral and cognitive correlates of successful suppression ability within among children with and without Chronic Tic Disorder (CTD).
 - Blink suppression was used an analogue to tic suppression among children without CTD.
- Examine the effect of directed attention on tic suppression among children with CTD.



Study Sample

- 131 children aged 8-14 years
 - 91 with Chronic Tic Disorder (PMTD, PVTD, TS; YGTSS >14)
 - 41 typically developing
- All participants underwent diagnostic interviews, cognitive testing, and behavioral suppression tasks in one 3-4 hour session
- Parents rated their children on
 - tics (YGTSS, PUTS),
 - clinical (CBCL, CYBOCS, Conner's ADHD scale,
 - and cognition (BRIEF were collected.



Study Methods

- Three suppression conditions
 - tic or blink freely/no suppression (**NoSupp**)
 - verbal instruction for tic/blink suppression (**Vsupp**)
 - tic/blink suppression for reward (**RSupp**)
- Two directed attention conditions: children instructed to:
 - focus solely on their blinks/tics and try to suppress as many as possible (**AttnTo**)
 - think solely about flanker task performance in order to obtain a reward (**AttnAway**)
- Conditions administered in counterbalanced order



Results – Group Differences

On average, the percent decrease in ticcing (CTD) or blinking (TDC) did not differ between the No suppression and the Active suppression conditions (all p's >.5)

- No Suppression = Verbal or Reward Suppression

Within the Chronic Tic Group, tic suppression was not significantly associated with YGTSS, CYBOCS, or PUTS



Results - Predictors

- Suppression measured by % decrease in tics/blinks between No Suppression and active Suppression conditions
- Better suppression (larger % decrease in tics/blinks) associated with:
 - Better **behavioral** functioning
 - (lower CBCL negative scales, higher CBCL positive scales, lower CPRS Hyp/Imp scores) (all p's <.05)
 - Better **cognitive** functioning
 - (Higher BRIEF subscales: Shift, Emotional Control, and Inhibit) (all p's <.05)



Results – Directed Attention

- **Attention Towards Tics:**

- Mean % decrease in tics from Tic Freely to Focus on Tics
 - Without Reward: **37%** (sd = 30.6)
 - With Reward: **45%** (sd = 32.1) $p < .05$

- **Attention Away from Tics:**

- Mean % decrease in tics from Tic Freely to Focus on Flanker Task
 - **73%** (sd = 33.2) $p < .001$



Conclusions

Overall, these results suggest that good suppression was:

- Predicted by better behavioral, clinical, and executive functioning
- But not predicted by tic severity, premonitory urge or obsessive-compulsive symptomatology.

The results also suggest that directing **attention away** from rather than towards tics **was a more successful strategy** for tic suppression.



Limitations

- Age-restricted sample (8-12 years); but developmentally heterogeneous
- Blink suppression in typically developing youth not a direct analogue of ticcing
- Flanker task focus may not be representative of typical attention away situations