Comprehensive Behavioral Intervention for Tics (CBIT)

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Research Support
- NIMH
- Tourette's Syndrome Association

Speaking honoraria
- From various academic institutions
- Tourette Syndrome Association

Royalties
- Guilford Publications
- Context Press
- Oxford University Press
- Springer Press

The person’s internal and external environment can impact TS symptoms

The effects of these factors are unique to the individual

To develop a useful treatment both the external and internal contingencies must be addressed

Behavioral Treatments are Based on Three General Ideas

- The person’s internal and external environment can impact TS symptoms
- The effects of these factors are unique to the individual
- To develop a useful treatment both the external and internal contingencies must be addressed

Environment-Tic Relationships that Maintain Tics

<table>
<thead>
<tr>
<th>Antecedents</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Places/Situations</td>
<td>Positive Reinforcement (e.g., others’ reactions to tics)</td>
</tr>
<tr>
<td>Other People</td>
<td>Negative Reinforcement (e.g., escape from activities, relief from aversive unpleasant internal experiences)</td>
</tr>
<tr>
<td>Activities</td>
<td></td>
</tr>
<tr>
<td>Internal Experiences</td>
<td></td>
</tr>
</tbody>
</table>

Managing External Factors

- External, and some internal factors are managed by functional assessment/intervention procedures
- In doing a functional analysis, we look for antecedents (things that come before the tic) and consequences (things that may be reinforcing the tic).
- After specific environmental variables are identified in the functional assessment, interventions are developed to decrease the effect of or contact with that variable

Negative Reinforcement Hypothesis of Tic Maintenance

Premonitory Urge — Tic — Relief

Negative Reinforcement
Managing Internal Environment

Premonitory Urge → Tic → Relief

Creates habituation to Premonitory Urge
Negative Reinforcement

Changing Internal Environment

- Habit Reversal Training (HRT)
  - Multi-component treatment (Azrin & Nunn, 1973)
  - 3 main components
    - Awareness Training
    - Competing Response Training
    - Social Support

Habit Reversal: Awareness Training

- Purpose
  - Help client discriminate episodes of behavior
- Three techniques
  - Response Description
  - Response Detection
  - Early Warning
- Necessary level of awareness is unclear

Response Description

- Help patient define the tic in great detail, paying attention to muscular sensations and bodily placement
  - Fill in definition where necessary
  - Describe sensations preceding tic
  - Describe any bodily signals that suggest tic is imminent

Response Detection & Early Warning

- Client practice
  - Client tics → client acknowledges → Praise client
  - Client tics → client does not acknowledge → prompt client
  - Continue until at least 80% correct
  - Have client simulate tics if he or she is not ticcing during session
  - Early warning involves replicating these procedures with the internal cues to tic or the external signals that tics are imminent

Habit Reversal: Competing Response Training

- Purpose
  - Give patient a behavior to do that is physically incompatible with the tic
- Three techniques
  - Choosing the Competing Response
  - Therapist simulation of competing response
  - Patient practice the competing response
Choosing the Competing Response

- Three rules when choosing CR
  - Incompatible w/ tic
  - Less socially noticeable/interfering than the tic
  - Patient can do CR for the required duration across multiple situations
- Choosing a CR should be a mutual decision b/w patient and therapist

Sample competing responses

<table>
<thead>
<tr>
<th>Tic</th>
<th>Competing Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arm Movements</td>
<td>Push hand down on thigh or abdomen and push elbow in towards hip</td>
</tr>
<tr>
<td>Eye Blinking</td>
<td>Systematic, voluntary, soft blinking consciously maintained at a rate of one blink per 2-3 seconds</td>
</tr>
<tr>
<td>Hand/wrist Movements</td>
<td>Push hands on arms of chairs, desk, leg, etc.</td>
</tr>
<tr>
<td>Head jerks/Movements</td>
<td>With head in centered position, contract the neck flexors so that the head tilts slightly downward and the neck appears shortened. If this is inadequate, push chin into sternum</td>
</tr>
</tbody>
</table>

Patient Practices Competing Response

- Have patient demonstrate CR and provide corrective feedback if necessary
- Have patient practice implementing CR contingent on actual tic (or simulated tic if necessary)
- Have patient practice implementing CR contingent on warning signs (or simulated warning signs if necessary)
- Therapist should prompt and praise as appropriate

CR Caveats

- Research suggests that CR need not be physically incompatible to be effective, but it makes more intuitive sense to start with an incompatible response
- CR must be done contingent on tic or warning sign to be effective
- CR is held for 1 minute or until the premonitory urge goes away (whichever is longer)
- CR tends to fade as the tic fades
**Habit Reversal: Social Support**

- **Purpose**
  - Reinforce and prompt use of competing response
  - Significant others prompt use of CR
  - Significant others praise correct use of CR

**Does HRT Work?**

- HRT has been studied for nearly 40 years using small-n and group experimental designs
- Considered an effective treatment for tics according to APA Division 12 Criteria (Cook & Blacher, 2007)
- Still, a lack of acceptance by medical community...
- HRT research still plagued by
  - Small sample sizes
  - Lack of independent evaluators
  - Lack of focus on external factors

**Comprehensive Behavioral Intervention for Tics (CBIT)**

Child Study: 126 children (ages 9-17) with TS/CTD
Adult Study: 122 adults (ages 16+) with TS/CTD

**Participating Sites**
- UCLA (Child: J. Piacentini, PI)
- Johns Hopkins University (Child: J. Walkup, PI)
- U. of Wisconsin–Milwaukee (Child: D. Woods, PI)
- Mass General Hospital/Harvard (Adult: S. Wilhelm, PI)
- Yale Child Study Center (Adult: L. Scahill, PI)
- U. of Texas Health Sciences Center (Adult: A. Peterson, PI)

Fundied by NIMH through two different mechanisms (R01 to TSA)

**Study Treatments**

**CBIT Components**
- Psychoeducation
- Habit Reversal Therapy
- Functional Intervention
- Reward System
- Relaxation Training

**Psychoed/Support Components**
- Phenomenology of TS
- Prevalence of TS
- Natural History of TS
- Common Comorbidities
- Causes of TS
- Psychosocial Impairments
- Nonspecific Support

**CBITS Eligibility Criteria**

**Inclusion**
- Age 9 to 17 (child) or ≥16 (adult)
- Primary diagnosis of DSM-IV-TR TS or Chronic Tic Disorder
- CGI-Severity > 3
- YGTSS Total Score > 14
- Unmedicated or stable medication
- Patient speaks fluent English
- Informed consent

**Exclusion**
- YGTSS Total Score > 30 (unless approved by caseness panel- 15 child cases of YGTSS >30 were approved: range = 31-42)
- IQ < 80
- CGI-Severity < 3
- Excessive/problematic substance use or CD past 3 months
- Lifetime diagnosis of DSM-IV PDD, Mania, Psychotic Disorder
- Any serious medical or psychiatric illness requiring immediate treatment other than provided in CBITS protocol
- Previous treatment with 4 or more sessions of HRT
CBIT Study Design

Assessment Schedule:

Week: 0 5 10 23 36

CBIT  Booster  Booster  Booster  Booster

Subjects with TS or CTD

Psychoeducation

Support

Supported by NIMH R01 MH070802 (Piacentini)

Child CBIT Study

Behavior Therapy for Children With Tourette Disorder: A Randomized Controlled Trial


http://jama.ama-assn.org/cgi/content/full/303/19/1929

Sample Characteristics - Child

<table>
<thead>
<tr>
<th></th>
<th>CBIT</th>
<th>PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>61</td>
<td>65</td>
</tr>
<tr>
<td>Mean Age (SD)</td>
<td>11.6 (2.3)</td>
<td>11.7 (2.3)</td>
</tr>
<tr>
<td>Gender (% Male)</td>
<td>75.4%</td>
<td>81.5%</td>
</tr>
<tr>
<td>WASI IQ (M, SD)</td>
<td>111.7 (13.5)</td>
<td>108.6 (14.0)</td>
</tr>
<tr>
<td>Stable Tic Meds at Entry (%)</td>
<td>36.7%</td>
<td>40.3%</td>
</tr>
<tr>
<td>Two Parent Family (%)</td>
<td>82.0%</td>
<td>87.7%</td>
</tr>
<tr>
<td>Father’s Occupation (% Professional)</td>
<td>60.7%</td>
<td>61.5%</td>
</tr>
</tbody>
</table>

Diagnostic Status

<table>
<thead>
<tr>
<th>Tic Disorder (%)</th>
<th>CBIT</th>
<th>PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourette Disorder</td>
<td>91.8</td>
<td>95.4</td>
</tr>
<tr>
<td>Chronic Motor Tic</td>
<td>6.6</td>
<td>4.6</td>
</tr>
<tr>
<td>Chronic Vocal Tic</td>
<td>1.6</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Diagnoses (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD</td>
</tr>
<tr>
<td>OCD</td>
</tr>
<tr>
<td>Generalized Anxiety</td>
</tr>
<tr>
<td>Separation Anxiety</td>
</tr>
<tr>
<td>Social Anxiety</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

Primary Outcome Measures

- Clinical Global Impression (CGI) – Improvement Scale (1-7)
- YGTSS- Total Tic Score (0-50)
- YGTSS- Impairment (0-50)
**CGI-Improvement Acute Phase Comparison**

*CBIT > PST, p < .0001
Medication status did not moderate outcome

**YGTSS-Total Tic Score (Adjusted Means) Acute Phase Comparison**

*CBIT > PST, p < .01; 10 week Effect Size d = .68
Medication status did not moderate outcome

**YGTSS-Total Tic Score (Adjusted Means) Acute Phase Comparison**

*CBIT > PST, p < .01; 10 week Effect Size d = .57
Medication status did not moderate outcome

**Adverse Events by Treatment Group**

<table>
<thead>
<tr>
<th>Event</th>
<th>CBIT N (%)</th>
<th>Control N (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Respiratory Infection</td>
<td>21 34.4</td>
<td>27 41.5</td>
<td>NS</td>
</tr>
<tr>
<td>Irritability, explosive behavior</td>
<td>10 16.4</td>
<td>10 15.4</td>
<td>NS</td>
</tr>
<tr>
<td>Headache</td>
<td>10 16.4</td>
<td>14 21.5</td>
<td>NS</td>
</tr>
<tr>
<td>Muscle or joint pain</td>
<td>9 14.8</td>
<td>13 20.0</td>
<td>NS</td>
</tr>
<tr>
<td>Accidental injury</td>
<td>7 11.5</td>
<td>19 29.2</td>
<td>0.02</td>
</tr>
<tr>
<td>Anxiety and nervousness</td>
<td>4 6.6</td>
<td>3 4.6</td>
<td>NS</td>
</tr>
<tr>
<td>Disruptive behavior</td>
<td>4 6.6</td>
<td>4 6.2</td>
<td>NS</td>
</tr>
<tr>
<td>Sore Throat</td>
<td>4 6.6</td>
<td>7 10.8</td>
<td>NS</td>
</tr>
<tr>
<td>Nausea, vomiting</td>
<td>2 3.3</td>
<td>5 7.7</td>
<td>NS</td>
</tr>
<tr>
<td>Stomach Discomfort</td>
<td>2 3.3</td>
<td>9 13.8</td>
<td>0.16</td>
</tr>
<tr>
<td>Dermatological problems</td>
<td>1 1.6</td>
<td>5 7.7</td>
<td>NS</td>
</tr>
<tr>
<td>Tic worsening</td>
<td>1 1.6</td>
<td>4 6.2</td>
<td>NS</td>
</tr>
<tr>
<td>Tiredness, fatigue</td>
<td>1 1.6</td>
<td>4 6.2</td>
<td>NS</td>
</tr>
</tbody>
</table>

**Maintenance of Responder Status (CGI-I): Completer**

% of Week 10 Responders

3 Month FU 6 Month FU

**YGTSS-Total Tic Score on Week 10 Responders Through Follow-up (Completer Analysis)**
**Adult CBIT Study**

Randomized Trial of Behavior Therapy for Adults With Tourette Syndrome (2012)
Sabine Wilhelm, PhD; Alan L. Peterson, PhD; John Piacentini, PhD; Douglas W. Woods, PhD; Thilo Deckersbach, PhD; Denis G. Sukhodolsky, PhD; Susanna Chang, PhD; Habel Liu, MPH; James Dziura, PhD; John T. Walkup, MD; Lawrence Scahill, MSN, PhD

Supported by NIMH R01 MH070802 (Peterson)
**ADULT Sample Characteristics at Baseline**

<table>
<thead>
<tr>
<th></th>
<th>CBIT</th>
<th>PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>63</td>
<td>59</td>
</tr>
<tr>
<td>Mean Age (SD)</td>
<td>31.5 (13.4)</td>
<td>31.4 (14.1)</td>
</tr>
<tr>
<td>Gender (% Male)</td>
<td>38 (60.3%)</td>
<td>40 (67.8%)</td>
</tr>
<tr>
<td>Tic Meds (%)</td>
<td>16 (25.4%)</td>
<td>16 (27.1%)</td>
</tr>
<tr>
<td>Other Psychiatric Meds (%)</td>
<td>23 (36.5%)</td>
<td>20 (33.9%)</td>
</tr>
</tbody>
</table>

**Diag nostic Status**

<table>
<thead>
<tr>
<th>Tic Disorder (%)</th>
<th>CBIT</th>
<th>PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourette Disorder</td>
<td>55 (87.3)</td>
<td>48 (81.4)</td>
</tr>
<tr>
<td>Chronic Motor Tic</td>
<td>7 (11.1)</td>
<td>11 (18.6)</td>
</tr>
<tr>
<td>Chronic Vocal Tic</td>
<td>1 (1.6)</td>
<td>0.0</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Other Diagnoses (%)</th>
<th>CBIT</th>
<th>PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD</td>
<td>17 (27.0)</td>
<td>16 (28.8)</td>
</tr>
<tr>
<td>OCD</td>
<td>13 (23.6)</td>
<td>9 (15.3)</td>
</tr>
<tr>
<td>Depression</td>
<td>2 (3.2)</td>
<td>1 (1.7)</td>
</tr>
<tr>
<td>Generalized Anxiety</td>
<td>6 (9.5)</td>
<td>5 (8.5)</td>
</tr>
<tr>
<td>Social Anxiety</td>
<td>1 (1.6)</td>
<td>3 (5.1)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (11.1)</td>
<td>15 (25.4)</td>
</tr>
</tbody>
</table>

**Responder Status at Week 10**

(CGI-Improvement = 1 or 2)

<table>
<thead>
<tr>
<th></th>
<th>CBIT</th>
<th>PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Week 10 responders who were Responders at 3 months</td>
<td>38%</td>
<td>7%</td>
</tr>
</tbody>
</table>

**YGTSS Total Tic Score**

<table>
<thead>
<tr>
<th></th>
<th>CBIT</th>
<th>PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 0</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Week 5</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Week 10</td>
<td>15</td>
<td>10</td>
</tr>
</tbody>
</table>

*CBIT > PST, p<.05

**YGTSS Impairment Score**

<table>
<thead>
<tr>
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<th>PST</th>
</tr>
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<tbody>
<tr>
<td>Week 0</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Week 5</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Week 10</td>
<td>15</td>
<td>10</td>
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</tbody>
</table>

*CBIT > PST, p<.05

**Maintenance of Responder Status (CGI-I): Completer**

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<tr>
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<th>CBIT</th>
<th>PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Week 10 responders who were Responders at 3 months</td>
<td>86.7</td>
<td>80</td>
</tr>
<tr>
<td>% of Week 10 responders who were Responders at 6 months</td>
<td>80</td>
<td>80</td>
</tr>
</tbody>
</table>

*CBIT > PST, p<.05
### Benchmarking CBIT Efficacy

<table>
<thead>
<tr>
<th>Comparison RCT</th>
<th>N</th>
<th>Group</th>
<th>YGTSS Total Score (%)</th>
<th>Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBIT</td>
<td>126</td>
<td>PST</td>
<td>31% 14%</td>
<td>0.7</td>
</tr>
<tr>
<td>CBIT-Adults</td>
<td>122</td>
<td>PST</td>
<td>26% 11%</td>
<td>0.6</td>
</tr>
<tr>
<td>Risperidone</td>
<td>34</td>
<td>PBO</td>
<td>36% 9%</td>
<td>1.0</td>
</tr>
<tr>
<td>Ziprasidone</td>
<td>28</td>
<td>PBO</td>
<td>35% 7%</td>
<td>0.9</td>
</tr>
</tbody>
</table>

CBIT is more efficacious than PST for
- Reducing tic severity
- Reducing tic-related impairment

CBIT efficacy similar to meds for tics
- Roughly similar symptom reduction rates
- Lower Effect Size (use of active comparison group)
- More favorably safety profile

CBIT responders maintain their gains and improve in other areas of functioning 6-mo after treatment

### Status of CBIT in TS Treatment Community

- CBIT is now recommended as a first line treatment option (ahead of medications if possible) by European TS Treatment Guidelines (2011) and by Canadian Guidelines (2012) for the Treatment of TS
- Is it being used?

### Availability of Behavior Therapy for TS: Survey of Parents in Community

- Parents consented: N = 992
- Parent type
  - Biological mother: 86.6%
  - Biological father: 6.2%
  - Adoptive mother: 4.1%
  - Other: 3.2%
- Parent age
  - M = 40.8, SD = 6.4
- Family income
  - N = 762, median = $75,000+

Conelea et al. (2011) *Child Psychiatry and Human Dev.*
Treatment: Children

10 Most Utilized Treatments for Tics (N = 496)
1. Medication: 82.6%
2. Diet alterations: 30.2%
3. Fatty acid (Omega-3) supplements: 23.9%
4. Behavioral/Cognitive-Behavioral Therapy: 23.9%
5. Psychotherapy (Not BT): 22.1%
6. Supplemental vitamins: 18.8%
7. Support group: 18.1%
8. Supplemental minerals: 12.9%
9. Massage therapy: 11.4%
10. Meditation: 11.2%

Reasons for Not Seeking Behavior Therapy
- Is there a specific reason that your child has not had BT for tics?
  - I’m worried that asking my child to suppress will cause other tics to start: 17.7%
    - Symptom substitution concerns
    - Rebound effect concerns
  - I don’t know where to go to receive this type of treatment: 40.5%
    - There is no one close to me that provides this service: 18.1%

Symptom Substitution: Fact or Fiction?
• Symptom substitution
  • Stopping one tic makes others worse, or are replaced by new ones

Does Symptom Substitution Occur?
• Multiple BL Across 5 Subjects with TS
• Initial assessment followed by in home recordings
• Habit Reversal (Woods, 2001)
  • 1, 1 hr session; 2, 1/2 hour booster sessions
  • 1 session per week for 3 consecutive weeks
  • Awareness training, competing response training, social support training

Symptom Substitution in CBIT?
• Throughout CBIT Trial, tics were scored weekly on Hopkins M/V Tic Scale.
• New tics were identified each week
• Regardless of condition (CBIT or Supportive Therapy), patients exhibited 1.25 new tics over 10 weeks
• No differences emerged between conditions on number of new tics
• In CBIT condition, reduction of targeted tics did not predict emergence of new tics
• Gender, age, OCD status, ADHD status, baseline severity, baseline impairment, nor baseline medication status predicted emergence of new tics

Peterson et al., manuscript in preparation
Rebound Effects: Fact or Fiction?

- Rebound effects
  - Trying to stop tics makes you tic more after you stop trying to suppress them

Tic Detector
- Remote controlled operant token dispenser
- Inactive computer camera mounted on top of box
- Tokens delivered by experimenter who observes from behind an observation mirror
- Tokens delivered for every 10 sec. tic-free intervals
- Interval resets if a tic occurs
- Tokens later exchanged for small amount of money

Is there a Rebound Effect? Study 1

- 7 children with TS
- Three conditions
  - Baseline
  - Reinforced suppression
  - Rebound evaluation
- All conditions were 5 minute
- Tics were reduced in suppression condition
- Rebound did not occur

Himle & Woods (2006)
*Behaviour Research and Therapy*

Is there a Rebound Effect? Study 2

13 children with TS or CTD
Mean YGTSS = 28.2
Woods et al. (2008). *Journal of Abnormal Child Psychology*
Funded by TSA

Reasons for Not Seeking Behavior Therapy

- Is there a specific reason that your child has not had BT for tics?
  - I’m worried that asking my child to suppress will cause other tics to start: 17.7%
    - Symptom substitution concerns
    - Rebound effect concerns
  - I don’t know where to go to receive this type of treatment: 40.5%
    - There is no one close to me that provides this service: 18.1%

Treatment Access

- Establishment of a specialty clinic
- Training and increasing knowledge of providers
- New formats of CBIT
- New delivery platforms
**UWM Tic Disorders Clinic**
- Located in Psychology Training Clinic
- Serves 50-60 patients/year from MKE, WI, & broader US
- Fee for service model→ internal seed funding for TS research and Grad Student Development
- Staffed by Clinical Doctoral Students
- Highly integrated with research functions

**Training New Providers**
- Translation of manual
- TSA/CDC Project
- Tourette Syndrome Association-Behavior Therapy Institute

**New CBIT Formats**
- **CBIT-Neurology (CBIT-N)**
  - Can an abbreviated form of CBIT initiated by a nurse-practitioner or physician in a medical setting be effective?
  - Preliminary data supportive, full scale test is next
- **CBIT-Junior (CBIT-JR)**
  - Can a form of CBIT be effective for children under 9?
  - Preliminary data are supportive, prevention trial is being planned
- **C-CBIT (Computerized CBIT)**
  - Can a self-help version of CBIT delivered via the internet be effective?
  - SBIR Grant with PsyTech, LLC (Houston, TX)
  - Phase 1 nearly complete, Phase 2 submitted in April

**New Delivery Platforms**
- Videoconferencing
- Skype
- Apps?

**Telehealth vs. Face-to-Face**
- 20 CBIT-Naive kids with CTD or TS
  - 16 boys, 4 girls
  - 11.3 years
- 2 Sites
  - SLC, MKE
- Randomized to TELE or F-2-F
- 8 Session CBIT Protocol

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Project funded by the TSA
Summary/Future Directions

- Long term follow-up
- Predictors of response to treatment
- Mechanism of change data
- Computerized self-help Phase II
- CBIT-JR Prevention study
- CBIT-N Efficacy study in medical clinics
- CBIT for repetitive behaviors in children with ASD
- Prescriptive Order through Sequential Multi-Assignment Randomized Trial (SMART)
- Enhancing CBIT outcomes