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Intensive Behavior Therapy for Tics and Co-Occurring ADHD: A Case Report

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Abstract

TDs can substantially impact daily child functioning across social, familial, and academic domains leading to a significant public health impact of TDs. Additionally, an overwhelming majority of children with a TD have at least one co-occurring disorder. In particular, over 60% of children with a TD also meet criteria for ADHD. Comprehensive Behavioral Intervention for Tics (CBIT) is a first-line treatment for youth with TDs. It has been shown to be effective in reducing the frequency, duration, and severity of tics in children and adolescents. Nonetheless, access to trained CBIT providers remains limited, and common comorbid conditions are not addressed in the standard CBIT. Thus, there is a need for interventions that can simultaneously increase CBIT access and incorporate treatment strategies for TDs and common comorbidities. To address the critical need for increasing access to CBIT and simultaneously treating common comorbidities, the current case study presents and evaluates a two-week intensive approach to simultaneously address tic and ADHD symptoms in an 11-year-old male. The patient's parents reported significant improvements in tic and ADHD symptoms following the end of treatment, which were maintained throughout two follow-up booster sessions. Clinical implications and future directions to modify and improve the proposed treatment are discussed.

Keywords: CBIT, tic disorders, ADHD, intensive intervention, case study

Intensive Behavior Therapy for Tics and Co-Occurring ADHD: A Case Report

Tic disorders (TDs) are neurodevelopmental disorders characterized by sudden and involuntary motor (i.e., arm jerking, shoulder shrugging) and phonic (i.e., throat clearing, animal sounds) tics. TDs encompass DSM-5 diagnoses of Tourette's disorder, persistent or chronic motor or vocal tic disorder, and provisional tic disorder (American Psychiatric Association [APA], 2013). Importantly, TDs have a significant impact on youths' overall daily functioning. Specifically, they can have deleterious effects on youth's social, familial, and academic functioning (Kurlan et al., 2001; Roessner et al., 2011; Specht et al., 2011) and are demonstrated to impair their quality of life (Storch et al., 2007). Further, parents of children with TDs are likely to experience increased stress and caregiver burden (Cooper et al., 2003). As a result, TDs impact the family unit's overall well-being.

Additionally, a majority of children with a TD meet criteria for at least one co-occurring disorder. In particular, over 60% of children with a TD also meet criteria for attention-deficit/hyperactivity disorder (ADHD) (Center for Disease Control and Prevention, 2009), a chronic neurodevelopmental disorder characterized by inappropriate levels of inattention, hyperactivity, and impulsivity (APA, 2013). Research suggests that co-occurring TDs and ADHD in childhood often lead to greater impairment than TDs alone (i.e., Lebowitz et al., 2012), including pronounced difficulties across family and social domains (Sukhodolsky et al., 2003).

Numerous randomized controlled trials have suggested that Comprehensive Behavioral Intervention for Tics (CBIT) is an effective intervention to reduce tic symptom severity, intensity, frequency and duration among children (e.g., Piacentini et al., 2010; Himle et al., 2012). McGuire and colleagues' (2014) recent meta-analysis found that individuals with a TD who engaged in a behavioral intervention, such as CBIT, were more likely to benefit from

treatment (i.e., reduction in tic symptoms), as compared to control interventions, and experienced comparable treatment effects to those found with α -agonist medication use. As such, the American Academy of Neurology (AAN; Pringsheim et al., 2019) recommends CBIT as the first line of treatment for individuals experiencing TD given its minimal risk (i.e., side effects) and equivalent efficacy when compared to alternative treatments (i.e., α -agonists, antipsychotics) (AAN; Pringsheim et al., 2019). These recommendations also include support for services provided via teleconference or video conference, should in-person services be unavailable or inaccessible to individuals with tics.

Traditionally, CBIT was designed to be an eight to 10-week, one-hour individual in-person treatment, during which functional assessments, relaxation and habit reversal training, and relapse prevention are taught to children and parents with the goal of reducing the patients' tic symptom frequency, severity, duration and intensity. However, despite substantial support for CBIT for TDs, two primary issues remain that limit the reach and impact of this intervention for children and families: (1) access to CBIT remains limited (Flancbaum et al., 2011; Pringsheim & Okun, 2019); and (2) highly comorbid disorders such as ADHD are not explicitly addressed in the standard treatment protocol (Coffey, 2015). As a result of these limitations, an alternative intervention modality that allows for increased access to CBIT and that provides treatment strategies for both TDs and equally impairing comorbidities, is warranted.

An important next step in treatment development for TDs is to reduce barriers to treatment by modifying CBIT in a more accessible and time efficient modality capable of treating co-occurring ADHD. Indeed, non-traditional delivery formats such as intensive interventions, as opposed to standard weekly sessions, are well-established for the treatment of related and comorbid disorders and have been shown to be an efficacious and cost-efficient

modality for delivering multimodal interventions (Fabiano, Schatz, & Pelham, 2014; Ehrenreich & Santucci, 2009). Intensive treatment delivery formats provide the opportunity for families to gain access to treatment for a limited period of time without the extended burden often associated with weekly treatment sessions. Further, intensive group-based treatments can simultaneously treat comorbidities more rapidly, as they provide temporal flexibility throughout the week to modify and adapt the intervention and do not require multiple visits to numerous treatment providers. Recently, there has been emerging evidence to support intensive, group-based interventions, particularly for diagnoses that are less common or are known to require specialized interventions that are not widely accessible. For example, Cornacchio and colleagues (2019) found that an intensive, group-based format for children with selective mutism was associated with minimal perceived barriers from caregivers, high treatment satisfaction, and clinically significant reductions in symptoms eight weeks post-treatment. Additionally, Graziano and colleagues (2020) evaluated an intensive model for behavioral parent training (BPT), an evidenced-based treatment for ADHD and disruptive behavior disorders (for reviews, see Evans, Owens, Wymbs & Ray 2018; Fabiano et al., 2009; Pelham & Fabiano, 2008). Similarly, results from this study found that BPT delivered in an intensive format was equally efficacious compared to standard weekly BPT, and that parents who experience high levels of stress were more likely to benefit from the intensive formats than standard BPT. Overall, intensive intervention modalities are effective across a number of childhood mental health illnesses, and this treatment delivery method could likely be extended to CBIT as a mechanism to target proximal outcomes (e.g., tics, disruptive behaviors) as well as distal outcomes (e.g., decreased parental stress, barriers to receiving treatment).

While initial support for an intensive form of CBIT has begun to emerge, the literature is limited. Flancbaum and colleagues (2011) adapted standard CBIT into a two-week intensive format for a 25-year-old male exhibiting motor and vocal tics. Findings suggest reductions in the participant's subjective units of distress (SUDS), however, no post-assessment Yale Global Tic Severity Scale (YGTSS; Leckman, 1989) was conducted to assess overall tic frequency, severity, intensity and duration changes post-intervention. The authors reported that the patient did not participate in booster sessions following the end of treatment and, therefore, treatment gains were not maintained. Blount and colleagues (2018) conducted a four-day intensive program (N=5), which resulted in improvements following the end of treatment for 4 out of 5 primarily adult participants. To our knowledge, only two studies to date have evaluated intensive CBIT in an exclusively pediatric population. Kennedy and colleagues (2016) provided eight sessions over the course of two consecutive weeks to 10 children ($M_{age} = 13.7$) and found significant treatment-induced improvements in YGTSS-assessed total tic severity. In addition, Heijerman-Holtgreffe and colleagues (2020) evaluated the use of a group-based intensive exposure with response prevention (ERP) protocol for 14 children ($M_{age} = 11.69$ years) and found a 16% reduction in total tic scores. While improvements were noted, the reduction reported in this study is significantly lower when compared to studies utilizing CBIT. Taken together, preliminary evidence for the utilization of intensive CBIT for children and adults is promising. However, none of the interventions described above included components targeting comorbidities explicitly despite their high incidence among individuals with TD.

Therefore, an integral next step is to evaluate a combined approach of CBIT and BPT provided in an intensive modality. This format may lead to more rapid reduction in symptoms, a more suitable format for families of children experiencing TDs and co-occurring ADHD, while

also providing increased access to evidence-based interventions that are often geographically limited. In order to address ADHD and TD symptoms simultaneously, the protocol by Woods and colleagues (2008) as well as standard BPT core constructs were adapted to meet the unique needs of families presenting with TDs and co-occurring diagnoses. First, overlapping strategies across both protocols were evaluated and selected based on their utility and appropriateness for children. For instance, the use of a reinforcement system through which specific behaviors and utilization of competing responses (CRs) can be specifically rewarded was considered to be of clinical utility for the simultaneous treatment of TDs and management of ADHD related behaviors. Further, additional strategies that incorporate differential attention, such as planned ignoring for reducing inappropriate behaviors and positive reinforcement such as labeled praise for increasing positive and/or desirable behaviors (e.g., practicing CRs for tics), were deemed most useful. Next, key elements from diagnosis-specific interventions, such as awareness training for detection of premonitory urges and strategies to evaluate and understand tics more thoroughly, and the use of effective behavioral management strategies (e.g., using short, clear, and direct commands), to address ADHD-related impairment were added to the treatment plan. Finally, the set of core skills selected were strategically adapted into an abbreviated format. As such, the following study used a case study design approach to evaluate the utility of an intensive and combined intervention for the treatment of TDs and co-occurring ADHD.

Case Presentation: Jacob

The following case study functions as a preliminary test of the acceptability, feasibility and effectiveness of the treatment described above. Jacob's parents sought services outside of their home country as there are no trained CBIT providers in their country. Further, the family was restricted to a two-week window for the intervention. As such, the intervention described

below was deemed to adequately suit the family's needs and time-restriction. A total of six intensive CBIT sessions (spanning across two weeks) were provided at a university-based outpatient clinic specializing in the treatment of Tourette Disorder and ADHD.

Relevant Background and Context

At the time of intake, Jacob was an 11-year, 9-month old biracial, Hispanic male who traveled with his biological parents, both mother and father, from his home country to receive treatment for both motor and vocal tics. His parents reported that Jacob's first motor and vocal tics appeared when he was 8 and 9 years old, respectively. Presenting problems at the time of intake included frequent vocal tics, namely cursing/swearing (or coprolalia). Furthermore, Jacob's parents reported that his vocal tics had become more impairing and intense due to an accompanying increase in voice-level volume coupled with higher rates and more complex coprolalia (e.g., a string of cursing/swearing as opposed to a single curse word). Furthermore, his parents reported that both vocal and motor tics were a source of significant impairment across home and school settings and with peers. Jacob was enrolled in a standard school setting, however, given increased volume and frequency of his vocal tic, which caused disruptions in the classroom, he often left school prior to standard dismissal time. Additionally, Jacob's parents were concerned for his self-esteem as he reported feelings of embarrassment and anger due to vocal tics within the school setting and in front of peers. As a result of the numerous domains of impairment at school, his parents reported switching his educational setting to home. Upon intake, Jacob was receiving home school education. At home, in addition to vocal tics, Jacob presented with both simple and complex motor tics, varying in the degree of impairment.

Jacob also presented to treatment with a prior diagnosis of ADHD, combined presentation, which was given at the age of five. Prior to intake, Jacob had been prescribed

Clonidine extended release as treatment for his ADHD-related symptoms and TD. Despite subsequent adjustments in medication dosage over the course of a year, Jacob's parents reported that they chose to discontinue the medication due to a perceived lack of improvement in both ADHD and TD-related symptoms.

Assessment and Diagnosis

Approximately eight months prior to the initial clinical assessment, Jacob received a full psychoeducational evaluation. The results of the psychoeducational evaluation included clinical diagnoses of Tourette Disorder and confirmation of ADHD, combined presentation. The YGTSS Global Tic Severity Scale Score from the psychoeducational evaluation was 66/100.

A thorough assessment of symptoms prior to treatment included a semi-structured clinical interview with Jacob's mother and father and a separate interview with Jacob, to evaluate tic-related and ADHD symptoms. The Disruptive Behavior Rating Scale (DBD-RS; Pelham et al., 1992) was administered to Jacob's parents to assess for ADHD-symptoms, whereby Jacob's parents endorsed 7/9 inattention and 6/9 hyperactive/impulsive symptoms. Jacob and parents completed the YGTSS, obtaining a Global Tic Severity Scale Score 66/100 for patient-and parent-reported assessments. Clinicians met to discuss severity ratings and used a multi-informant approach to determine an overall severity score.

Treatment

Intensive Course of Treatment

A complete outline of session content is provided in Table 1. Sessions were conducted across three unique phases. Phase one consisted of skill building, phase two of practicing and reinforcing, and phase three of review and booster sessions. Within each phase, parent- and child-specific strategies, as well as combined strategies were employed.

Phase 1: Skill Building. Treatment began with the clinicians separately providing Jacob and his parents psychoeducation about tics. Jacob also created a hierarchical list of current tics, as well as learned awareness training and relaxation strategies (deep breathing and progressive muscle relaxation). Procedures for determining and utilizing CRs were also introduced to Jacob. Parents were taught basic awareness training and CR development procedures and how to create and implement a reward system. In order to address ADHD symptoms, parents were provided with skills to utilize differential attention (e.g., ignoring inappropriate and praising appropriate behavior) and effective instruction (e.g., direct commands). Behavioral management strategies intended to address more serious behaviors such as non-compliance and aggression (e.g., time-out) were not taught, as Jacob readily followed directions with limited prompting and did not exhibit aggressive behavior towards others. With guidance from the clinicians, Jacob and his parents collaboratively developed a reward system in which Jacob actively participated by selecting prizes that he deemed rewarding and were subsequently used to reinforce appropriate behavior and skill use throughout the course of treatment. This final step was importantly established prior to phase 2 (practicing and reinforcing) in order to ensure that Jacob was familiar with the procedures and was adequately reinforced by the selected prizes.

Phase 2: Practicing and Reinforcing. During this phase, the clinician met with Jacob alone and practiced awareness training and created a CR for two current and impairing tics (one motor and one vocal tic). Once the CRs were created, sessions consisted of repeated practice using the CRs as well as implementing and modifying in-session and at-home behavioral charts and reward systems. As practice with CRs continued, necessary modifications were made as needed in order to ensure that the most effective CR was utilized. During this phase, session 4 took place 2 days following session 3 to allow for extended practice time. Further, a modified

behavioral chart and reward system was created for when the family returned home. In order to meet Jacob and his family's unique needs, additional time was spent on awareness training, which utilized immediate rewards in conjunction with practice. For example, a minimum of 45 minutes in sessions 1 and 2 were spent on awareness training and CR practice. Each time Jacob was engaged in awareness training, he earned points towards a larger reward. Further, sessions 2-6 also utilized this strategy to help Jacob engage in awareness training and CR practice. Outside of session practice (homework) was emphasized throughout treatment and Jacob's was successful in completing a large majority of practice between sessions with some support from his mother. Awareness practice was suggested between each session for a minimum of one-hour with parent and child.

Phase 3: Review and Booster Sessions. The final in-person sessions consisted of relapse prevention, with particular emphasis placed on creating CRs for new tics that may appear in the future. Further, CRs for both tics and relaxation strategies were practiced. Lastly, the clinicians worked collaboratively with Jacob's mother to establish a behavioral chart and reward system to ensure continued practice at home, such that Jacob would earn incentives when using CRs and relaxation techniques as well as when meeting behavioral expectations (e.g., staying on task during school assignments). Rewards were tiered into small, medium and large rewards based on size, cost and Jacob's indication of degree of desirability, and included additional screen time (i.e., extra television, tablet or videogame usage), time with friends, (i.e., playdates or sleepovers), toys and small desserts. Booster sessions took place approximately three and six months following the end of treatment and were individualized to meet the family's needs at each time point. The first booster session consisted of a review of progress since their last session and addressing any questions or difficulties they were experiencing with using the

strategies learned throughout treatment. Specifically, Jacob's parents requested a review of each CR, as well as the steps to identifying premonitory urges and creating CRs. At the second booster session, a review of praise and differential attention, as well as creating and modifying CRs was completed. Parents were receptive to the intervention strategies and were able to aid their child in the utilization of the skills at home.

Treatment Outcomes

The YGTSS total score following treatment was 40/100, indicating a 26-point decrease from the psychoeducational evaluation and pre-treatment assessments (see Figure 1). It is important to note that between the psychoeducational evaluation and the pre-treatment assessment, Jacob had been prescribed Clonidine extended release to address TD and ADHD symptoms. However, pre-treatment YGTSS scores indicated no change from the psychoeducational evaluation to the initial intake assessment, despite the use of medications for over one year prior to the initial intake assessment.

During the booster sessions, Jacob's parents indicated significant improvements in tic severity, duration and frequency. During booster session one, Jacob's parents indicated brief instances of "flare ups" occurred; however, these periods of time lasted approximately one day (as compared to pre-treatment, when such periods of time would have lasted up to three weeks). While his parents reported that their use of strategies had decreased following the end of treatment, they felt confident in their ability to reinstate any needed skills should tic symptoms reemerge significantly. During the final booster session, parents reported improvements in Jacob's behavior, particularly with his ability to remain on task during at-home school assignments with additional support from parents, as well as his use of CRs when needed. Jacob was also receptive to attending

booster sessions and was able to collaboratively create and modify CRs with minimal support from the clinician.

Additionally, during the final booster session, the clinician received feedback from Jacob's parents regarding the format, structure and content of the two-week intensive intervention they had received. Jacob's parents reported overwhelming support for the simultaneous CBIT and BPT approach, indicating that learning skills related specifically to TDs and ADHD within the same treatment format, and with the same treatment providers, was invaluable. His parents also reported that the use of CBIT skills were helpful and necessary core skills; however, the additional parenting skills, such as differential attention and praise were vital, as they provided strategies to promote positive interactions with Jacob, as well as improve his behavior. Overall, Jacob's parents noticed significant improvements in TD and ADHD-symptom severity.

Discussion

The current case study provides preliminary support for combining CBIT and BPT and suggests that simultaneous implementation of strategies may be useful in treating TDs and co-occurring diagnoses, such as ADHD. Jacob exhibited significant improvements in tic symptomatology, as well as reductions in impairment associated with ADHD. The findings in the current study are consistent with reductions in tic symptom severity following standard CBIT strategies (Dutta & Cavanna, 2013). Earlier case studies suggest that children with disruptive behaviors may not be suitable for intensive CBIT (Blount et al., 2014), however, these studies were limited to the standard CBIT protocol, which does not include strategies to manage such behaviors. By incorporating behavioral management strategies, such as a behavioral chart to target the most impairing behaviors and the utilization of reinforcement strategies, such as a point system – in which Jacob earned points immediately after exhibiting appropriate behaviors

– we were able to successfully address co-occurring ADHD symptoms and ultimately increase Jacob’s active participation throughout sessions.

The evidence from the current study is promising and begins to fill an important gap in the TD treatment literature. Jacob’s parent’s qualitative feedback suggested overall acceptability of the intervention, as well as areas of improvement for treatment to further engage future families. Specifically, his parents indicated that more time in sessions throughout the day, such as morning and afternoon sessions within the same day, would be beneficial to ensure proficiency with using each skill. Thus, this extended time within the same day may provide clinicians with the opportunity to incorporate additional strategies to address comorbid diagnoses, such as Cognitive Behavioral Therapy skills, or expand upon BPT skills learned within treatment, and also aid families in identifying associated triggers and/or stressors that may be limited to certain hours of the day. It was noted that a group-based format would have also been useful for children and parents to provide and gain social support and share their unique experiences with TDs and common comorbidities.

Given that access to trained providers in both CBIT and BPT is limited, the current study’s format provides the opportunity for families to access treatment providers in an abbreviated manner, while also allowing for longer-term care through booster sessions conducted via telehealth (as needed). This study was conducted over the course of two weeks, however, the total number of intervention sessions, including the initial evaluation, was conducted over the course of seven days. Therefore, this intervention is likely amenable to further alterations to the treatment schedule to allow for accommodations associated with each family’s differing schedules, such as occurring over one week of a school vacation or over the summer. While it is possible that there may be reductions in between-session CR practice, intensive formats would

be more conducive to maximizing in-session practice, as compared to a weekly format and may ensure that additional practice using CRs is accomplished during treatment. Overall, an intensive, combined intervention approach may be an acceptable alternative to traditional intervention modalities, as it likely reduces several barriers to treatment.

Internet-based booster sessions also offer additional time spent practicing and modifying strategies that may integral to maintaining gains seen throughout treatment and generalize these gains to the patient's naturalistic home environment. Booster sessions allow for individualized review and practice of skills that may reinforce their use after intensive treatment termination. Importantly, Flancbaum and colleagues (2011) noted that, while improvements were initially seen post-treatment, due to lack of participation in booster session, treatment gains were not maintained once the patient returned home. Therefore, these booster sessions likely provide additional and necessary support to families in order to ensure that skills learned throughout treatment are accurately and effectively implemented at-home. Future studies should evaluate the utility of internet-based booster sessions and their effectiveness in maintaining treatment gains.

Preliminary evidence from the current case study suggests that combined CBIT and BPT can be a useful treatment modality for children experiencing TDs and co-occurring ADHD or other disruptive behavior disorders. The current treatment design provides an alternative to attending sessions with separate providers who specialize in TDs or ADHD and facilitates an increased access to care for families without providers within their community. Families and children experiencing significant distress and/or impairment from tics and who exhibit symptoms of co-occurring diagnoses are likely good candidates for the current treatment and may benefit from an intensive format in which presenting diagnoses can be targeted simultaneously.

This study is not without limitations. First, the results are based on a single patient and, therefore, the generalizability of the current findings are not known at this time. Second, specific patient and parent treatment satisfaction measures were not utilized; instead this information was collected via anecdotal evidence from parents. Future studies would benefit from utilizing standardized treatment satisfaction questionnaires to evaluate family's overall perspectives of the treatment protocol. However, to avoid clinician bias, post-treatment assessments of tic symptoms were collected by a third-party clinician who was not involved in the treatment of Jacob and his family. While immediate post-treatment assessments were not able to be collected, evaluations conducted four months following the end of treatment indicated long-term improvements, which may reflect a more important metric of longevity of improvements, and a possible underestimate of immediate post-treatment reductions in TD symptoms. Nonetheless, future studies should evaluate immediate post-treatment tic symptoms in addition to long-term changes. Finally, future studies should evaluate the effectiveness and acceptability of combining CBIT and BPT in a larger sample to determine the generalizability of the current study's findings.

Notwithstanding its limitations, the current study provides preliminary evidence for an abbreviated and combined intervention to address tic- and ADHD-related symptoms concurrently. Importantly, an intensive intervention format allows for families to exclusively focus on the acquisition and use of strategies without as many interferences from non-treatment related responsibilities. Additionally, a group-based version of this format would allow for treatment providers to offer services to a larger number of patients, particularly given the shortage of trained CBIT therapist nationally, while simultaneously reducing the geographic barrier often associated with finding a provider. Future studies are warranted to determine the efficacy of this treatment format, as well as the possibility of utilizing patient feedback provided

in the current case study to evaluate a group-based combined intervention. Specifically, given that individual parent and child, as well as combined sessions were conducted to address TD and ADHD symptoms simultaneously, group-based intensive interventions should consider adopting this multimodal approach to provide general TD management strategies within a group setting, as well as individual patient-specific sessions to address their unique impairment due to co-occurring diagnoses strategies. This format likely alleviates many of the limitations indicated in the current case study (i.e., group-based social support, increased number of sessions per day, reduction in the total number of days spent in treatment) to improve overall outcomes for children experiencing TDs and ADHD and may also be more cost-effective for treatment providers.

TDs are prevalent throughout the United States and can lead to significant impairment in children's school and social functioning, as well as impact their family's overall well-being. Youth with TDs are also likely to experience a comorbidity, with ADHD as the most prevalent co-occurring diagnosis. Despite significant effort to train providers in CBIT nationally, access to providers still remains geographically limited. Currently, CBIT and BPT are both first-line non-pharmacological interventions to address TDs and ADHD and may drastically reduce impairment associated with these diagnoses. Therefore, the findings from the current study provide preliminary evidence for a cost- and time-efficient treatment alternative for families seeking behavioral interventions for TDs and ADHD that can simultaneously address common co-occurring diagnoses symptomatology.

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Table 1.*Session Outline and Description of Session Content*

Session Number	Combined Session Content	Individual Session Content – Parent	Individual Session Content – Child
1 _a	Psychoeducation, awareness training, introduction to reinforcement	Parent orientation to CBIT	Identification of target tics, awareness training practice, relaxation
2 _a	Brief check-in	Praise and rewards	Awareness training practice, development of competing response for Tic 1, relaxation
3 _a	Review of competing response for Tic 1, modification of competing response, behavioral chart creation and tangible rewards	Session conducted jointly	
4 _b	Brief check-in, review of competing response for tic 1, modification of behavioral chart and tangible rewards, relaxation	Differential attention, effective instructions	Competing response practice for tic 1, competing response creation for tic 2
5 _a	Competing response practice, behavioral chart for at-home use, tangible rewards	Session conducted jointly	
6 _a	Relapse prevention, competing response practice, relaxation, home-based rewards and behavioral chart		
Boosters _c	Check-in and problem solving; review of awareness training and creation of competing responses		

_a duration of session =1.5 hours; _b duration of session =1 hour; _c duration of session = 30 minutes per session

Figure 1.

YGTSS Global Tic Severity Scale Score by Timepoint