COMPREHENSIVE BEHAVIORAL INTERVENTION FOR TICS SPECIALTY CLINIC OUTCOMES

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COMPREHENSIVE BEHAVIORAL INTERVENTION FOR TICS SPECIALTY CLINIC OUTCOMES

by

Brandon X. Pitts, B.S.

A Thesis submitted to the Faculty of the Graduate School,
Marquette University,
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the Degree of Master of Science

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ABSTRACT
COMPREHENSIVE BEHAVIORAL INTERVENTION FOR TICS SPECIALTY CLINIC OUTCOMES

Brandon X. Pitts, B.S.
Marquette University, 2024

Tics are abrupt, repetitive, and non-rhythmic movements (motor tics) and vocalizations (vocal tics). Persistent (Chronic) Tic Disorders (PTDs), which include conditions such as Tourette Disorder (TD), are characterized by involuntary motor and vocal tics. PTDs are associated with a myriad of adverse social repercussions, reduced quality of life, and concurrent psychiatric diagnoses, and occur in approximately 1.1% to 4.8% of the global population. Comprehensive Behavioral Intervention for Tics (CBIT) stands as the primary nonpharmacological therapeutic approach for tics. Although the efficacy of CBIT has been established in multiple large-scale randomized control trials (RCTs), there is a paucity of research scrutinizing the effectiveness of CBIT within standard outpatient settings. Consequently, the current study involved a chart review in a university-based clinic to elucidate the effectiveness of CBIT in a psychology training clinic that specializes in tic treatment. Objective 1 sought to use preexisting data on tic severity and self-reported distress to assess the outcomes of a CBIT specialty training clinic. Patients who receive CBIT in this setting were hypothesized to experience a significant reduction in tic severity and tic-related perceived distress from first to last visit. Objective 2 aimed to investigate potential differences in the duration of administration between a naturalistic context of CBIT and the standardized CBIT protocol. It was hypothesized that the average number of CBIT sessions delivered to patients in a real-world community clinic would be notably lower than the predetermined quantity outlined in the standard CBIT protocol. Objective 3 aimed to investigate whether patient sex at birth and age predicted change in tic severity over the course of CBT. It was hypothesized that greater tic severity would be reduced more significantly for males and older patients compared to females and younger patients.
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Introduction

Clinical Characteristics of Tics

Tics are repetitive, nonrhythmic motor movements and vocalizations that typically develop between the ages of 5 and 9 and affect around 1 of 5 school-aged children (von Knorring, 2003; Scahill et al., 2005; Robertson, 2008a, b). Individuals meet diagnostic criteria for provisional tic disorder (DSM-V TR, 2022) if they experience motor and/or vocal tics for less than a year. Should tics endure for more than one year, individuals may receive a diagnosis of Persistent Tic Disorder (PTD), previously termed Chronic Tic Disorder (CTD). This classification encompasses either Persistent Motor Tic Disorder (PMTD) or Persistent Vocal Tic Disorder (PVTD), in addition to Tourette's Disorder (TD). To qualify for a PTD diagnosis (motor or vocal), an individual must have experienced at least one motor or vocal tic continuously for over a year. A diagnosis of TD is assigned to those individuals who have had multiple motor tics and at least one vocal tic persisting for at least one year (American Psychiatric Association, 2022).

PTDs affect between 1.1-4.8% of the world population, and TD affects around 0.6-1%, predominately affecting males (Khalifa and Von Knorring, 2003; Khalifa and Von Knorring, 2005; Knight et al., 2012; Hirschtritt, M. E. et al., 2015; Cavanna and Termine, 2012). Tics peak in severity around the age of 11 (Bloch et al. (2006), and tic disorders are known to have a genetic relationship with other psychiatric disorders (Comings, 1990); 78% to 90% of individuals with PTDs are diagnosed with at least one other psychiatric condition (Freeman RD et al., 2000; Specht et al., 2011; Hirschtritt et al., 2015; Wright et al., 2012; Lebowitz et al., 2012; Sambrani, Jakubovski, & Muller-Vahl, 2016). The most common of these include...
obsessive-compulsive disorder (OCD) and attention-deficit and hyperactivity disorder (ADHD), which affect approximately 40% (Apter et al. 1993; Pauc, 2005) and 50%-80% (Freeman RD et al., 2000; Pauc, 2005) of individuals with PTDs respectively. Persons with PTDs exhibit increased anxiety, depression, rage attacks, and impulse control disorders compared to the neurotypical population (Eddy et al., 2011; Lebowitz et al., 2012; Mol Debes et al., 2008; Sambrani et al., 2016; Specht et al., 2011).

Individuals with PTDs also experience deficits in psychosocial skills, academic performance, and familial relationships (Conelea et al., 2014; Espil et al., 2014; Zinner et al., 2012). Likewise, they experience more intense frustration and confusion, lower self-esteem, heightened self-consciousness, and a greater likelihood of feeling persecuted (Bawden et al., 1998). Along with elevated levels of psychiatric comorbidity, such challenges often result in various life difficulties, including significant financial burdens, high rates of academic problems, considerable distress, and a decline in life quality (Robertson, 2008; Cavanna, 2012; Himle, 2019). Those with PTDs are also more likely to experience bullying victimization and perpetration among children (Charania et al., 2022; Mingbunjerdsuk et al., 2020; Zinner et al., 2012). Tic severity varies widely, and greater tic severity leads to more significant tic-related impairment (Espil et al., 2014).

**Premonitory Urge Phenomenology**

Tics are frequently preceded by an unpleasant somatic sensation known as a premonitory urge, which worsens when tic suppression occurs (Leckman, 1993). Individuals experience this urge differently, and most describe that the anatomical location of the urge varies according to the tic (Cavanna et al., 2017; McGuire et al., 2016). Countless analogies have been used to
describe this urge, with some likening it to a sense of pressure (Leckman et al., 1993), while others describe it as an itching sensation (Bullen and Hemsley, 1983) or a "somatic hyperattention" (Kane, 1994, p. 2). As itching is alleviated by scratching the affected area, the premonitory urge can be relieved by performing a specific tic.

**Treatments for Tics**

**Medical Treatments**

Until recently, pharmacotherapy was the sole first line of treatment for tics, with alpha-2 agonists or antipsychotics being the most common choice of medications (Roessner et al., 2013). Alpha-2 agonists, such as guanfacine and clonidine, often serve as the initial pharmaceutical intervention for treating tics, as both have few side effects and are also effective in treating ADHD symptoms (Bloch et al., 2009, Conner et al., 1999). Nevertheless, given the slightly less effective tic suppression effects of alpha-2 agonists, antipsychotics are more typically used for people with moderate to severe tics (Scahill et al., 2006). In such cases, atypical antipsychotics, like risperidone, are often prescribed (Qasaymeh & Mink, 2006). Traditional antipsychotics, like haloperidol, are typically limited to use in more severe cases due to their more substantial side effect profiles (Sine & Sethuraman, 1997). Botulinum toxin injections (Marras et al., 2001) and deep brain stimulation (DBS) (Maciunas et al., 2007, Ackermans et al., 2006, Servello et al., 2008) may also be effective tic management methods, though both are invasive procedures.

**Behavioral Treatments**

Behavioral therapies (BT) for the treatment of tic disorders have recently gained a considerable amount of attention. The behavioral treatments with the most empirical support are
Exposure and Response Prevention (ERP), Habit Reversal Training (HRT), and Comprehensive Behavioral Intervention for Tics (CBIT).

**Exposure and Response Prevention (ERP)**

ERP is comprised of 12, two-hour sessions designed to teach patients to habituate to premonitory urges (Verdellen et al., 2011). The ERP protocol involves two key components: response prevention, in which patients practice suppressing all their tics, and premonitory urge exposure, which entails a gradual introduction of patients to their premonitory urges while actively suppressing their tics.

Throughout treatment, patients work on simultaneously suppressing all their tics, with the ultimate objective of extending the duration of tic suppression. Clinicians play a pivotal role in response prevention, encouraging patients to confront and resist premonitory urges, and reinforcing the benefits associated with tic suppression. Patients are encouraged to apply their tic suppression skills outside of the therapy sessions.

**Habit Reversal Training (HRT)**

HRT is comprised of three key components: awareness training (AT), competing response training (CRT), and social support (Azrin & Nunn, 1973; Miltenberger et al., 1985; Woods & Miltenberger, 1996; Woods et al., 1996). Each of these treatment elements is administered for each specific tic, with one targeted tic addressed in each session. Awareness Training (AT) involves two key steps: response description and response detection. During response description, patients learn to create a comprehensive account of the targeted tic, and through response detection procedures, the therapist employs prompts and reinforces the patient for correct detection of the tics. The primary objective of AT is to enhance the patient's real-time
awareness of the targeted tic and improve their ability to predict when it will manifest.

Subsequently, patients are directed to establish a competing response (CR), an alternative behavior that is (a) incompatible with the tic, (b) sustainable for at least a minute or until the urge to tic subsides (whichever is longer), (c) less conspicuous than the tic, and (d) applicable in any setting and at any time. The patient is taught to use a competing response that is contingent upon the targeted tic or its related premonitory urge. Finally, to augment adherence to the competing response, an individual is selected to offer social support, which involves encouraging and reinforcing the patient's correct application of the competing response, as well as offering essential support and motivation during the treatment regimen. In HRT, tics are treated one at a time, and the first tic usually addressed is rated by the patient as the most distressing using the Subjective Units of Distress (SUDS) Scale conducted prior to the initiation of the HRT protocol.

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

CBIT is a structured 10-week program encompassing several core components, as detailed by Woods et al. (2008). These components include psychoeducation, function-based assessment/intervention, HRT, a motivational reward program, and relaxation training. Psychoeducation serves as the initial phase of CBIT and plays a crucial role in enhancing patients' comprehension of tic disorders. It also serves to rectify common misconceptions associated with therapy, mitigate stigma and self-blame, and lay the groundwork for a deeper understanding of CBIT's theoretical underpinnings. Following psychoeducation, the function-based assessment/intervention component employs a clinician-administered interview to assess the antecedents and consequences that exacerbate tics. Subsequently, the clinician formulates an individualized intervention plan to address or eliminate antecedents that heighten tic frequency
and eliminate tic-related consequences, such as those involving attention and escape. The HRT protocol discussed above is then applied in a sequential manner, with each session focusing on one specific tic. To maintain patient engagement and commitment to the program, a motivational reward program is implemented to incentivize participation, completion of homework assignments, and consistent attendance. Recognizing the relationship between tics and increased muscle tension and anxiety, the CBIT protocol also incorporates relaxation techniques, including diaphragmatic breathing and progressive muscle relaxation, to further enhance the therapeutic benefits. Among the array of behavioral therapies available for tics, CBIT stands out as the most widely recognized and empirically supported treatment.

**CBIT Efficacy versus Effectiveness**

Rounsaville et al. (2001) proposed a three-stage framework for the progression and dissemination of psychological treatments. Stage 1 involves two distinct phases of research: the first focusing on therapy development and manual writing, while the second involves pilot testing a nearly finalized version of the therapy. Upon the completion of therapy development, comprehensive manual creation, and promising pilot study outcomes, Stage 2, begins and involves the initiation of a Randomized Controlled Trial (RCT) to evaluate treatment efficacy.

Efficacy studies seek to ascertain whether an intervention produces expected outcomes under optimal conditions (Gartlehner et al., 2006). Consequently, efficacy research places significant emphasis on bolstering internal validity through meticulous design, execution, and analysis, addressing the question, “Does this treatment deliver as claimed under ideal circumstances?” (Andrade, 2018). It is crucial to acknowledge that studies assessing the efficacy of interventions typically involve the comparison of an intervention group with a control group,
to which participants are randomly assigned. Moreover, participant homogeneity between study groups is carefully assessed to mitigate the potential of between-group differences in sample composition confounding the study results. These efficacy considerations are normally accounted for by running studies that incorporate a RCT study design. Upon the completion of Stage 2 research, during which the treatment has demonstrated efficacy in a minimum of 2 RCTs, Stage 3 research begins: focusing on evaluating the effectiveness of efficacious treatments in clinical settings.

Effectiveness studies, also referred to as pragmatic trials, evaluate the practical positive impact of a treatment within real-world clinical settings (Gartlehner et al., 2006). Treatment effectiveness studies prioritize external validity, ensuring that outcomes can be generalized to broader populations or contexts. This shift allows researchers to refine their inquiries, transitioning from asking, "Does this treatment deliver as claimed?" in efficacy studies to determine, "Is this efficacious treatment effective when administered in real-world clinical populations and settings?". Effectiveness research is imperative to account for potential contextual variations, participant diversity, and the generalizability of findings to real-world settings, thus enhancing the robustness and applicability of the research outcomes.

**Methodological Considerations**

Designs used to establish a treatment’s efficacy and effectiveness should be viewed as distinct and are intended to complement each other. Their synergy addresses pivotal questions essential for evaluating the impact of interventions (Hunsley & Lee, 2007). Numerous methodological considerations underlie intervention efficacy and effectiveness research, spanning distinct phases from pre-intervention to intervention implementation and post-
intervention evaluation. Efficacy and effectiveness research rigorously incorporate these considerations to ensure the study adequately addresses the questions relevant to the stage of research.

**Pre-Intervention Considerations**

Addressing the question of treatment efficacy necessitates careful consideration of extraneous factors that could confound the results. Efficacy studies are designed with control and standardization to increase the likelihood of obtaining meaningful results and eliminating alternative explanations for the outcomes. Central to this notion are meticulous participant selection processes, which are aimed at minimizing pretreatment differences between treatment groups and reducing variability within these groups (Streiner, 2002). Variables such as race, age, sex, previous treatments received, symptom severity, and comorbid diagnostic status are controlled for through randomization to prevent their potentially confounding effects on study outcomes. Furthermore, the implementation of extensive inclusion and exclusion criteria is a common practice in efficacy studies and is used to mitigate the influence of external factors on treatment outcome.

In contrast, effectiveness research adopts a more inclusive approach to subject selection, allowing for a broader participant pool without stringent predefined criteria. This flexibility acknowledges that real-world treatment scenarios may involve patients who do not align with the specific criteria employed in efficacy research. Effectiveness studies seek to determine how a treatment unfolds in practical settings, and thus variables controlled for in efficacy research may be embraced as integral components of contextualizing a clinical population in effectiveness research.
**Intervention Considerations**

There are notable methodological differences with respect to administering treatments within treatment efficacy vs. effectiveness studies. For example, in treatment efficacy research, there is systematic training of providers, the utilization of a detailed treatment manual, and rigorous oversight/assessment of treatment sessions to ensure adherence to the prescribed intervention. The treatment manual serves as a guiding blueprint during these studies, with strict adherence to the outlined duration and number of treatment sessions.

In contrast, intervention effectiveness research is conducted within a clinical setting, where providers, with varied levels of training and experience, engage with patients actively seeking their services. In this context, the treatment provider is afforded greater autonomy in treatment delivery, assuming responsibility for all clinical decision-making pertaining to their patients. This includes considerations such as the duration of treatment and the specific content covered during the intervention. It is noteworthy that this shift in agency reflects the dynamic and pragmatic nature of effectiveness research in real-world clinical scenarios.

**Post-Intervention Considerations**

Another distinguishing factor between efficacy and effectiveness studies pertains to their handling of participants post-intervention. In efficacy studies, efforts are made to eliminate any factors that might interfere with answering the fundamental question, "does the intervention work?" Various variables warrant participant exclusion in efficacy studies, such as non-adherence to treatment, participant drop out, and the use of non-study medications that could impact symptoms. The decision-making process when participants drop out of an efficacy study is intricate, as outlined by Streiner (2002). The primary consideration in this scenario is to ensure
that the data remain pertinent to answering the fundamental question of intervention efficacy. In contrast, effectiveness research aims to include as many participants as possible, recognizing that a patient’s exposure to real-life experiences contributes to the establishment of a naturalistic context.

The distinction between treatment efficacy and effectiveness research holds significance in the development of impactful treatments. Understanding how interventions perform under controlled conditions (efficacy) and in real-world settings (effectiveness) provides a comprehensive view of their potential utility and generalizability. In the subsequent section, I briefly review existing studies that explore the efficacy and effectiveness research on the aforementioned behavioral therapies for tics. This review aims to contribute to the broader understanding of the therapeutic landscape, shedding light on the nuances of treatment outcomes in both controlled and real-world scenarios.

**Efficacy and Effectiveness Support for ERP and HRT for Tics**

Within this section, we examine studies evaluating the efficacy and effectiveness of ERP, HRT, and CBIT. The scope of this review is restricted to efficacy and effectiveness studies that evaluate the empirical foundation of ERP and HRT administered through traditional, in-person individual therapy formats.

The prevailing consensus in the literature suggests that efficacy and effectiveness research exist along a continuum. Although standardized tools, as developed by Gartlehner (2006), aid in discerning this distinction, a consensus on the myriad factors contributing to this differentiation, remains elusive. Consequently, the proposed criteria will be employed to categorize studies as either efficacy or effectiveness, aligning with the delineation provided by
Rounsaville et al. (2001). Stage I research will be excluded from this evaluation. This decision stems from the understanding that Stage I research is conducted preemptively, preceding efficacy and effectiveness research. Stage II, or efficacy studies, will encompass RCTs evaluating the efficacy of manualized and pilot-tested treatments that demonstrated promise in Stage I research. These studies may also investigate the effectiveness of individual treatment components subsequent to establishing overall treatment efficacy in RCTS. Stage III, or effectiveness studies, will encompass investigations into the transportability of efficacious treatments substantiated by at least two RCTs. Effectiveness research addresses concerns regarding generalizability, implementation procedures, cost-effectiveness, and consumer/marketing aspects in clinical settings (Rounsaville et al., 2001).

In reviewing efficacy studies, I report details pertaining to the implemented behavioral intervention, participant sample size, inclusion/exclusion criteria, the comparison group utilized, standardized primary outcome measures, treatment administration protocols, study results, and identified limitations. In the context of effectiveness research, I reviewed information on what manuals or study procedures the behavioral intervention treatment was based on, participant recruitment sources, the real-world clinical group under evaluation, primary outcome measures and their standardization, details on practitioner training and supervision, and data on treatment satisfaction ratings obtained from both patients and therapists. This next section aims to summarize the existing efficacy and/effectiveness literature for ERP, HRT, and CBIT and detail the strengths and weakness seen in the literature.

*Exposure and Response Prevention (ERP) Efficacy*
Research on ERP efficacy is relatively limited. A study conducted by Verdellen et al. (2004) compared ERP and HRT in 43 participants with tic disorder. To satisfy the eligibility criteria for study participation, individuals were required to meet the criteria for TD. Exclusion criteria included a diagnosis of major depressive disorder, psychotic disorder, autism, intellectual disability, or a neurological condition other than TD. An HRT treatment condition was utilized as a comparison group. The primary outcome measured utilized for this study was the Yale Global Tic Severity Scale (YGTSS), a standardized measure of tic severity. Both treatment conditions were administered according to treatment manuals for ERP (Hoogduin et al., 1997) and HRT (Azrin and Nunn, 1973). ERP involved 12 sessions of 120 minutes each, while the HRT consisted of 10 sessions of 60 minutes each. The study identified a comparable degree of reduction in tics in both conditions post-treatment, and during a 3-month follow-up session. However, it is worth noting that the ERP required almost twice as many treatment hours to achieve comparable results compared to HRT. A limitation of this study arises from the constrained sample size employed, particularly considering the division of participants into two treatment groups.

Prospective efficacy investigations should aim to enroll substantial sample sizes and assess maintenance more frequently over an extended duration. This approach is essential to mitigate the potential impact of power issues on findings and to ensure the consistency and enduring maintenance of treatment outcomes over the long term. Moreover, prospective research on ERP (Exposure and Response Prevention) should incorporate a comparative analysis with a control group that receives an intervention of equivalent duration as the ERP treatment. Such a
comparison is necessary to mitigate the possibility that observed outcomes are attributable to differences in treatment duration rather than the efficacy of the treatment itself.

**Exposure and Response Prevention (ERP) Effectiveness**

To date, there is an absence of studies evaluating the effectiveness of in-person, individually administered ERP. This is unsurprising, given that only one RCT to date aligns with the minimal criteria suggested for an efficacy study. Consequently, to meet the criterion detailed by Rounsaville et al. (2001) at least one more RCT must be conducted before embarking on investigations into the effectiveness of ERP.

**Habit Reversal Training (HRT) Efficacy**

In the initial HRT efficacy study, Azrin et al. (1980) randomized 22 individuals across diverse age groups to either the HRT intervention (n = 10) or a negative practice (n=12) group. Inclusion criteria mandated prior consultation with a neurologist. Notably, no specified exclusion criteria were outlined, and individuals using tic-reducing medications were permitted to participate. Tic severity was assessed through patient self-report. The HRT protocol detailed by Azrin and Nunn (1973, 1977) was applied for participants in the HRT condition and the negative practice condition procedure was adapted from Smith (1957). In the negative practice condition, participants executed tics in front of a mirror at 30-second intervals over a one-hour session, interspersed with brief breaks. Simultaneously, participants verbally reminded themselves by stating, "this is what I am not supposed to do." Participants underwent one or two 2.5-hour sessions of either HRT or negative practice. Results indicated significant reductions in reported tic severity within the HRT group compared to the negative practice group, and these gains were
sustained at the 18-month follow-up. Limitations of this study include the studies minimal inclusion/exclusion criteria, and lack of standardized tic severity measure.

Azrin and Peterson (1990) conducted a controlled trial comparing HRT to a wait list control in 14 participants diagnosed with TD. Inclusion criteria specified individuals with a confirmed TD diagnosis, while exclusion criteria encompassed those with severe intellectual disability or autism, recent therapeutic interventions for emotional or personality disorders, and individuals anticipating relocation or prolonged absence from the study's geographic location within the next year. Observational measurement of tic frequency served as the primary outcome measure. The HRT protocol outlined by Azrin and Nunn (1973, 1977) was employed as a manual for administering HRT. On average, participants underwent 20 sessions of 2.5 hours each. All treated individuals exhibited significant reductions in tic frequency compared to the waiting-list control group. A limitation of the study is the reliance on tic frequency as the primary outcome, as this measure lacked standardization and validation for assessing treatment outcomes (Azrin and Peterson, 1990), thus compromising the study's efficacy assessment. Furthermore, the absence of standardization in the number of administered sessions constitutes a limitation as it augments variance, thereby diminishing the study's statistical power.

Efficacy studies by Wilhelm et al. (2003) and Deckersbach et al. (2006) have also been conducted with sample sizes larger than those in earlier studies, with 32 and 30 participants, respectively. Both studies required participants to have a diagnosis of TD. Exclusion criteria for these studies included the presence of psychotic disorders, substance abuse or dependence, organic mental disorders, severe major depression, suicidal depression, verbal IQ below 80, and the presence of a neurological condition other than TD. Those on psychotropic medications for
tics were eligible for the trial if the current dosage of all psychotropic medications had remained stable for a minimum of three months. Additionally, inclusion criteria required patients to commit to no dosage or medication adjustments and refrain from starting new medications throughout the study period. Both studies conducted a comparative analysis between HRT and a control group receiving supportive psychotherapy, a widely employed treatment aimed at alleviating distress and enhancing patients' coping skills. The administration of HRT treatment in both studies adhered to the specified treatment protocol outlined by Azrin and Nunn (1973, 1977), while the delivery of supportive psychotherapy was consistent with a protocol based on Pinsker and Rosenthal (1988). Both treatment conditions consisted of 14 individual 50-minute treatment sessions conducted over a five-month period. These research studies improved upon the previous research’s methodologies by implementing a standardized measure of tic severity with proven validity and reliability. The primary outcome measure employed in this study was the Yale Global Tic Severity Scale (YGTSS), acknowledged as the gold standard for evaluating tic severity. Additionally, treatment progress was evaluated using the Clinical Global Impressions Scale – Improvement (CGI-I), a widely-utilized measure for gauging the individual's response to treatment. Both investigations demonstrated more pronounced reductions in tics within the HRT group in comparison to the control group, and a 6-month follow-up showed that these reductions maintained. The small sample size of this study, though larger than its predecessors, was still a study limitation.

In summary, multiple studies assessing the efficacy of HRT have been conducted. Despite the presence of certain methodological limitations in these studies, research investigating the efficacy of HRT is compelling. Future efficacy studies of HRT, particularly those
incorporating larger sample sizes, could contribute to the existing body of research. Notably, the studies referenced here generally feature relatively small sample sizes.

**Habit Reversal Training (HRT) Effectiveness**

Currently, there is a dearth of studies evaluating the effectiveness of in-person, individually administered HRT. Following the completion of additional efficacy studies with larger sample sizes, it will be imperative to embark on research assessing the effectiveness of HRT within clinical settings. This is essential to ascertain the generalizability of treatment outcomes observed in efficacy studies. It is crucial that these investigations encompass diverse populations, employ standardized outcome measures, and involve therapists trained in the specific treatment and in receipt of consultation.

**Support for the Efficacy of CBIT for Tics**

The efficacy of CBIT was established in two large-scale randomized controlled trials. Piacentini et al. (2010) randomly assigned 126 children with tics to eight CBIT sessions or a psychoeducation and supportive therapy (PST) control group. The CBIT group showed significantly reduced tic severity and a higher number of clinical responders compared to the control group. Research findings indicate that these positive outcomes were sustained at a 6-month follow-up (Woods et al., 2011). Furthermore, a recent investigation conducted by Espil et al. (2022) showed that these favorable results endure even after 11 years following the completion of treatment. Similar results were found in studies on adults with Tourette’s Disorder (TD) or persistent tic disorders (PTDs; Wilhelm et al., 2012). This study showed that the CBIT group had greater reductions in tic severity compared to the PST control group. Most initial treatment responders sustained their improvements at a 6-month follow-up.
The documented efficacy of CBIT stands out, particularly when compared to other forms of BT for PTDs, having been established by two well designed, large-scale RCTs. CBIT has been shown to contribute to a notable reduction in tic severity and positively influences various clinical outcomes in both pediatric and adult populations. However, while the efficacy of CBIT is firmly established through research with rigorous methodologies, the documentation of its effectiveness in real-world settings remains comparatively sparse.

**Support for the Effectiveness of CBIT for Tics**

Research on the effectiveness of CBIT in naturalistic clinical settings is limited. Dreison and Lagges (2017) assessed the tic severity of 10 pediatric patients with diagnosed tic disorders before and after treatment, utilizing the Clinical Global Impressions Scale – Severity (CGI-S) as the primary metric. Clinic-based CBIT treatment significantly diminished tic symptom severity, and this reduction was achieved with adaptable utilization of the CBIT manual. This study represents the initial demonstration of CBIT's effectiveness beyond controlled conditions. Moreover, the study's findings suggest that the typical number of treatment sessions required for success closely resembled the original Woods et al. (2008) CBIT protocol. Nevertheless, the small sample size in the present study represents a significant limitation.

In a study mentioned earlier, Rowe et al. (2013) assessed the effectiveness of CBIT in treating 30 children diagnosed with a tic disorder. In this open trial, an occupational therapist provided treatment. The primary outcome variable in this research was the PTQ, assessed during all 8 treatment sessions. The results indicate a significant decrease in tic severity over the course of the treatment, underscoring the effectiveness of CBIT when applied to individuals with tic disorders who are undergoing treatment under the care of occupational therapists.
CBIT has garnered substantial empirical support for its efficacy; however, the body of research on its effectiveness is comparatively limited. This discrepancy leaves open the question whether CBIT’s efficacy readily extrapolates to clinical settings with less standardization. Consequently, more naturalistic studies with broader demographic representation are necessary to better understand the effectiveness of CBIT in a more representative population. A pivotal demographic variable to investigate is the potential influences of participant sex and age on treatment outcomes in a study assessing the effectiveness of CBIT.

**CBIT Outcomes by Participant Sex**

Little research has investigated the impact of sex on CBIT outcomes, with only one efficacy study and no effectiveness studies evaluating these outcomes to date. Sukhodolsky et al. (2017) combined participants from two similarly designed CBIT efficacy studies, one with child participants (Piacentini et al., 2010) and the other with adults (Wilhelm et al., 2012). The study found that participant sex did not predict tic severity or any other CBIT outcome. Furthermore, they found that sex did not moderate CBIT outcomes. Nevertheless, there are still reasons to believe that differences in outcomes may exist by participant sex.

First, females with tics are diagnosed with, non-OCD, anxiety disorders at a higher rate than their male counterparts (Garcia-Delgar et al., 2021; Girgis et al., 2022; Lewin et al., 2012), while the opposite is true for ADHD, with significantly more males being diagnosed with comorbid ADHD than females (Freeman et al., 2000). Within the context of CBIT, comorbid anxiety disorders have been linked to less tic reduction over the course of treatment, while having comorbid ADHD diagnoses was not linked to any significant difference in treatment outcomes (Sukhodolsky et al., 2017). Second, child and adolescent males experience higher tic
severity than their female counterparts (Garcia-Delgar et al., 2021), and research has shown that greater tic severity at baseline predicted a greater reduction of tics regardless of treatment condition. Third, Lewin et al. (2012) found that adult women with tics reported higher stress levels than men. This is important to note because a study by Conelea et al. (2011) found that higher levels of stress may negatively impact tic suppression abilities, suggesting that individuals experiencing more stress may receive less benefit from therapies focusing on tic suppression strategies. Combined, these findings suggest that males may be more responsive to CBIT than females.

**CBIT Outcome Age Differences**

Research on whether age differences impact CBIT outcomes is limited, with only Sukhodolsky et al. (2017) studying the issue and finding that age does not predict or moderate any CBIT outcomes. However, this research was limited partially due to the strict age eligibility criteria restriction typically imposed in the RCTs, which denied participation to children under the age of 9 years and to those with tic severity either below 15 or above 30 on the YGTSS. These findings prompt concerns regarding the applicability of the results to younger age groups and to individuals at the extremes of symptom severity. Additionally, the limited research investigating the influence of age on treatment outcomes necessitates further exploration to elucidate this association. Various factors suggest a plausible connection between age and treatment outcomes.

When considering how patients of differing ages may respond to behavioral treatment, it is important to consider cognitive capacity, as patients must have the capacity to comprehend and execute the treatment. A crucial element of CBIT involves awareness of the premonitory
urge preceding tics. Findings from a study by Woods et al. (2005) suggest that awareness of premonitory urges varies significantly with age, with individuals aged ten and below demonstrating significantly lower awareness compared to those over the age of ten. Considering this observation, age may influence treatment outcomes considerably, with younger patients being less likely to exhibit favorable responses to treatment.

Treatment engagement and homework adherence also play a role in the arguments detailed above. Haddock et al. (2006) found that younger patients are harder to engage in treatment, and a study by Essoe et al. (2021) examining the role homework adherence plays in BT for TD, observed that older patients exhibit higher levels of homework adherence compared to their younger counterparts. Furthermore, Essoe et al. showed that greater homework compliance predicted greater treatment outcome in CBIT. This is especially important to note given the substantial amount of homework assignments typically associated with behavioral interventions.

Given the multitude of age-related factors to consider, it is imperative to explore age as a predictor of CBIT outcomes in effectiveness studies with a broader age distribution. Such a distribution will allow for a more meaningful examination of how patient age may relate to changes in tic severity throughout the course of CBIT treatment. Given the important role both homework adherence and cognitive capacity play in successfully completing CBIT, it is hypothesized that older individuals will have better CBIT outcomes than younger individuals.

**Purpose of the Current Study**

The current study explores tic-related outcomes of patients going through treatment at a university-based outpatient specialty clinic that follows the CBIT protocol. Utilizing pre-existing
data from a community clinic, my aim is to evaluate the effectiveness of CBIT when applied within a specialized tic disorder clinic. This study attempts to contribute to the existing research by addressing three objectives:

**Study Objectives**

*Objective 1*: Treatment outcomes within a community-serving specialty clinic remain relatively unexplored. The primary objective of this study is to systematically investigate two primary outcomes associated with CBIT throughout the course of treatment. Specifically, the focus will be on evaluating changes in tic severity and the distress associated with tics.

*Hypothesis 1a*: Patients receiving CBIT at a community-serving clinic will exhibit significant reductions in tic severity as measured by the PTQ.

*Hypothesis 1b*: Similarly, hypothesis 1b postulates that self-reported tic-related distress will decrease pre to post treatment as measured by SUDs ratings.

*Objective 2*: The aim of this objective is to examine whether the quantity of CBIT sessions administered in a clinical environment significantly differs from the number recommended in the Woods et al. (2008) manual.

*Hypothesis 2a*: During clinical implementation of CBIT, the treatment’s inherent flexibility in administration, provides therapists with the capacity to customize interventions to match the unique presentations and needs of individual patients. As such, it is hypothesized that the mean number of CBIT sessions administered to patients in a naturalistic community clinic will be significantly fewer than the predetermined number specified in the standard CBIT protocol (n=11).
Objective 3: Prior studies have predominantly focused on evaluating the efficacy of CBIT within cohorts predominantly composed of young males. Consequently, the principal objective of Objective 3 will be to add to the understanding of the influence of sex and age on CBIT outcomes. This will involve an examination into whether participant sex and age are related to changes in tic severity over the course of treatment.

Hypothesis 3a: As previously stated, females with tic disorders are more likely to have a comorbid diagnosis of anxiety, and to report higher levels of stress, both of which have been found to negatively impact outcomes in the treatment of tic disorders. This sex disparity in comorbid anxiety disorder rates and stress levels lead me to hypothesize that pre-post reductions in tics will be significantly higher in males compared to females.

Hypothesis 3b: Given previous research showing that older individuals exhibit better homework adherence and cognitive capacity, it is hypothesized that there will be a significant positive correlation between the amount of pre-post reduction in tic severity and participant age.

Method

Participants

A retrospective chart review was conducted on a cohort of 69 patients from a single-site University Specialty Clinic that treated patients from the greater city area. These patients all had self- or parent-reported impairment arising from their tics, which prompted them to seek treatment. The eligibility criteria for inclusion in the study involved patients who had been seen at the clinic between March 2016 and October 2023 and fulfilled the following criteria:
(a) Consent from the patient or patient’s guardian (if patient is a minor) prior to starting treatment.

(b) The patient (and consenting adult for minors) had to speak fluent English.

Exclusion criteria encompassed the following:

(a) Patients meeting criteria for any severe psychiatric or neurological condition that necessitated a more immediate intervention or that was likely to significantly impede the therapeutic process, as determined by the treating therapist or their supervisor.
**Procedures**

*Initial Assessment.* The initial assessment consisted of a comprehensive two-hour evaluation conducted at the clinic. This evaluation was conducted by either master’s level clinicians or clinical psychology Ph.D. students, all operating under the supervision of a licensed clinical psychologist. It involved a psychological screening utilizing various assessment tools. During this initial assessment, an unstructured interview was conducted, and the demographics form (described below) were utilized to gather demographic information, details about patients' presenting problems, developmental/medical history, and social life. The data collected in the study were collected as part of a larger standard intake which included several behavioral symptom inventories that are not described here. In the current study, I report on data from the demographics form completed during intake and from in-session data collected during treatment sessions.

Following the initial assessment, patients were offered treatment clinic or were appropriately referred to more suitable services. Treatment initiation occurred promptly, typically within a few weeks of evaluation. The CBIT protocol described in Woods et al. (2008) served as a foundational framework for the administration of CBIT but was customized to accommodate the unique needs and circumstances of each patient. Following the initial evaluation, PTQ and SUDS were employed as variables to assess the response of patients to treatment. These measures were collected at the beginning of each treatment session until the patient terminated treatment.

**Measures**
Demographic Form (Appendix A). The demographics form asked about various sociodemographic information and was intended to be completed by a participant’s caregiver. The document included questions about the child’s age, assigned sex at birth, race/ethnicity, tic diagnostic status, and age of tic onset. The client's comorbid diagnoses and tic treatment history were also documented.

Parent Tic Questionnaire (PTQ; Appendix B). The PTQ (Chang et al., 2009) is a 28-item questionnaire that measures the severity of an individual's tics. Tic severity over the past week is determined by examining presence, frequency, and intensity. Tic presence is scored as either present or not present. Tic frequency is scored on a 1 to 4 scale; 1 meaning tics only occur a few times or less a week, 2 meaning tics occur around a couple of times a day, 3 meaning tics occur around once an hour, and 4 meaning that tics are constantly occurring during the day. The frequency and intensity of tics are measured for all present motor and vocal tics, with a client’s total tic severity score resulting from the addition of frequency and intensity scores for all the clients' present tics. The total tic severity scores, as assessed by the PTQ, encompass a range from 0 to 224, with the maximum score per item set at 8 for each of the 28 questionnaire items. In the initial PTQ study, the observed average total tic severity score was 38.15, accompanied by a standard deviation of 30.5 (Chang et al., 2009).

The reliability and validity of the PTQ have been tested on multiple occasions, with all studies showing the PTQ to have highly acceptable to excellent internal consistency (α = 0.79 and .90), good to excellent temporal stability (ICC = 0.77 to .91), good convergent validity with the Yale Global Tic Severity Scale (YGTSS; Leckman et al., 1989; Storch et al., 2005) and the Hopkins Motor/Vocal Tic Scale (HM/VTS; Walkup
et al., 1992), and good discriminant validity with the ADHD Rating Scale-IV (ADHD RS-IV; Zhang et al., 2005), Child Behavior Checklist/6-18 (CBCL/6-18; Dutra et al., 2004; Leung et al., 2006), and the Children's Yale-Brown Obsessive-Compulsive Scale (CY-BOCS; Storch et al., 2004; Ricketts et al., 2018). In this study, the PTQ was completed by the parent of the patient at the beginning of each CBIT treatment session.

**Subjective Units of Distress Scale (SUDS; Appendix C).** The SUDS (Wolpe, 1958) is a scale ranging from 0 to 100 that measures the perceived intensity of distress an individual is experiencing. This measure was later modified by Woods et al. (2008) to measure the subjective intensity of distress associated with each identified tic. This modified version of the SUDS is a scale ranging from 0 to 10, with a score of 0 indicating no distress and 10 indicating maximum distress. In the context of this study, a weekly Subjective Units of Distress Scale (SUDS) score was computed by summing the scores of each specific tic for that week and subsequently dividing the total by the number of assessed tics. The SUDS score ratings were collected weekly at the beginning of each CBIT session until the completion of the treatment.

**Number of Sessions Attended.** The quantification of CBIT sessions was accomplished by reviewing the progress notes associated with patient profiles. Progress notes were systematically generated for each session attended by the patient.

**Results**

*Clinical Characteristics & Demographics*
The clinical characteristics of the current sample are presented in Table 1. The sample was primarily older, Caucasian, male children with persistent tic disorders. Comorbid diagnoses had been reported in slightly over one-third of the sample.

**Results from Test of Hypothesis 1**

**Hypothesis 1a**

A 2 (male vs. female) x 2 (pretreatment vs. posttreatment) ANOVA was performed to evaluate the effects of sex at birth and treatment timepoint on tic reduction. This analysis involved a sample of 53 participants out of the initial cohort of 69 individuals. Of the original 69 patients, 16 did not have usable data because they did not complete two PTQ assessments while receiving CBIT, thus making it impossible to measure change in tic severity (see Figure 5). Results of the 2x2 ANOVA indicated a significant main effect for treatment timepoints, $F(1, 51) = 14.5, p < .001$, partial $\eta^2 = 0.221$, 95% C.I. [5.10, 13.50], confirming that PTQ scores reduced from pre- to post treatment (see Figure 1). Overall, there was a $M=10.8$ (SD=2.84) point (i.e., 37.8%) reduction on the PTQ from pre-post treatment.

When looking at individual responses to treatment, research conducted by Ricketts et al. (2018) has shown that patients who experience a PTQ reduction of 55% or 10-points should be classified as treatment responders. Of the 53 patients eligible for inclusion in this analysis, 50.9% ($n=27$) met this criterion and were considered treatment responders.

**Hypothesis 1b**

To test the impact of CBIT on tic-related SUDS scores, a paired samples t-test was conducted. A decrease in SUDS scores was found from pretreatment ($M=4.80$,
SD=2.13) to posttreatment (M=2.72, SD=1.82), \( t(43) = 5.96, p < .001, d=2.3, \text{C.I.} \ [0.54, 1.25] \) (see Figure 2). This analysis involved a sample of 44 participants out of the initial cohort of 69 individuals. Of the 25 who were excluded patients did not complete two SUDS assessments during the treatment period (see Figure 5).

**Results from Test of Hypothesis 2**

**Hypothesis 2**

I tested if the quantity of CBIT sessions attended by patients significantly deviated from the prescribed number of sessions (n=11) outlined in the CBIT manual. Data were accessible for all 69 patients (see Figure 5). Utilizing a one-sample \( t \) test with a significance level (\( \alpha \)) of .05, the findings indicated that clinic patients attended significantly fewer sessions (M = 6.78, SD = 4.03) compared to the number (n = 11 sessions) described in the standardized protocol, \( t(68) = -8.70, p < 0.01, d= 4.02 \) (two-tailed), C.I. \([-1.34, -0.75]\).

**Results from Test of Hypothesis 3**

**Hypothesis 3a**

Hypothesis 3a examined the relationship between patient age and pre-posttreatment change in tic severity. Change in tic severity was computed by subtracting tic severity scores from the PTQ collected at the final CBIT session from the PTQ score collected at the beginning of the first CBIT session. Data pertaining to age (M = 11.06 years, SD = 3.38) and changes in PTQ scores (M = 10.8, SD = 2.84) were obtained from a sample comprising of \( N = 53 \) participants. In the initial cohort of 69 individuals included in this analysis, 16 patients did not complete two PTQ assessments throughout the treatment period (see Figure 5).
Using a two-tailed test at $\alpha = 0.05$, the Pearson product-moment correlation between patient age and tic severity change was not significant, $r(51) = 0.07$, 95% CI [-0.205, 0.333], thus failing to confirm the relationship between age and tic reductions seen during a course of CBIT.

**Hypothesis 3b**

The aforementioned 2x2 ANOVA was used to evaluate the effects of sex at birth (Male and Female) and treatment timepoint (pre-treatment vs. post-treatment) on tic reduction. Results showed no significant main effect for sex at birth, $F(1, 51) = 0.252$, $p = .618$, partial $\eta^2 = 0.005$, 95% C.I. [19.05, 38.08] and no significant interaction between timepoint (pre-treatment vs. post-treatment) and sex at birth (Male vs. female), $F(1, 51) = 2.04$, $p = 0.159$, partial $\eta^2 = 0.038$, 95% C.I. [3.81, 14.0], thus failing to confirm the hypothesis that males and females would differ in their response to CBIT (see Hypothesis 1a results).

**Discussion**

CBIT is a well-supported and empirically validated intervention for tics (Pringsheim et al., 2019). Multiple RCTs have contributed to this evidence base, employing larger sample sizes, and providing crucial insights into the efficacy of CBIT across both pediatric and adult populations (Piacentini et al., 2010; Wilhelm et al., 2012). This research indicates that, under optimal conditions, the efficacy of CBIT is comparable to pharmacological interventions in reducing tic severity. Although this work provides extensive support for the *efficacy* of CBIT, research exploring the *effectiveness* of CBIT remains relatively limited. Consequently, the question of CBIT's practical effectiveness in clinical settings warrants further investigation. Such research can shed
light on whether the intervention remains impactful when administered under less controlled circumstances to a more varied population.

This study addressed gaps in the existing CBIT effectiveness literature by pursuing three primary objectives. First, it sought to compare pre-treatment and post-treatment results for individuals receiving CBIT at a University-based tic disorder specialty clinic. Second, the study examined whether there exists a significant variance between the actual number of sessions administered in an outpatient clinic and the number of sessions specified in the CBIT manual. Finally, the study examined the influence of patient age and sex at birth on treatment response, contributing valuable insights into the role these demographic factors play in the effectiveness of CBIT.

Hypothesis 1

Consistent with the first hypothesis, results showed a significant reduction in PTQ scores from pre-treatment to post-treatment, aligning with prior studies evaluating the efficacy (Piacentini et al., 2010; Wilhelm et al., 2012) and effectiveness (Andrén et al., 2021; Dreison and Lagges, 2017) of CBIT. Furthermore, the response rates demonstrated in the current study (51% responders) mirror the response rate found by Piacentini et al. (54% responders; 2010). This is especially noteworthy given that therapists working in the specialty clinic were predominantly graduate student clinicians with limited clinical expertise. Such findings suggest that CBIT delivered in a specialized community clinic effectively reduces tic severity at levels similar to those found in tightly controlled efficacy studies.

In addition to demonstrating that individuals receiving CBIT in a tic clinic see reductions in tic severity, the current study expanded the literature by examining changes
in tic-related distress associated with CBIT. Understanding the impact of treatment on the subjective distress experienced from tics is also important, as it is possible for individuals to exhibit low tic severity yet experience significant distress from objectively mild tics. The current study showed that tic-related SUDS scores, similar to tic severity, also reduced significantly from pre-treatment to post-treatment, and serves as only the second formal evaluation of tic-related perceived distress within CBIT research. Similar to the current study, the initial study by Rowe et al. (2013) observed a statistically significant reduction in SUDS ratings from pre-treatment to post-treatment.

Despite this positive contribution to the literature, it is important to note that the psychometric properties of SUDS in measuring perceived distress from tics has yet to be formally evaluated. Future research should address this gap in the literature to ensure that SUDS scores effectively measure what it was designed to measure when administered to patients with tics.

Hypothesis 2

Consistent with hypothesis 2, results indicate that individuals in a specialty clinic received fewer sessions than were recommended in the standard CBIT protocol. Furthermore, given the findings for hypothesis 1a, this study showed that the abbreviated number of sessions did not appear to come at the expense of reduced treatment effectiveness, as the current study found a response rate comparable to previous CBIT efficacy research (Piacentini et al., 2010). This finding is supported by research on HRT, a fundamental component of CBIT. Studies, including those by Azrin et al. (1980) and Woods (2001), have demonstrated the effectiveness of variations of HRT in fewer than the recommended 12 sessions. Multiple factors may contribute to the reduced number of
sessions observed in this specialized clinic. First, it is plausible that individuals undergoing community-based treatment may not require all the elements of CBIT offered in the manual, as determined by the attending clinician. For instance, patients presenting at the clinic may exhibit varying levels of familiarity with tic-related concepts, thereby necessitating adjustments in the psychoeducational aspect of CBIT. Furthermore, the manualized HRT protocol typically prescribes a regimen structured for addressing six tics, implying that individuals with fewer tic manifestations may require shorter durations of treatment. Additionally, the allocation of time dedicated to relaxation techniques warrants consideration. These strategies prove beneficial particularly in cases where individuals encounter challenges in managing stress and anxiety, both of which have been correlated with exacerbating tic symptoms (Coffey et al., 2000; Conelea et al., 2011). However, should anxiety or stress not impact a particular patient’s tics, such treatment elements may not be utilized.

Second, patients may perceive their treatment endpoint differently than the protocol's definition of a satisfactory conclusion. In the standard efficacy protocol, patients complete 11 sessions and treat as many tics as possible within that time frame. In contrast, a community-based specialty clinic can operate with greater flexibility. For example, patients going through CBIT might decide that despite having multiple tics, they only want treatment for the ones causing them the greatest distress. From this perspective, patients or their guardians may conclude treatment upon achieving the progress they envision. As a result, an individually altered CBIT approach, commonly observed in clinical practice, may significantly deviate from the protocol. Further research is warranted to explore what components of CBIT are implemented most
frequently and the number of tics targeted for treatment in a clinical setting as compared to a tightly controlled efficacy study.

A third reason for the difference in the number of sessions utilized between the two types of studies may involve differences in patient presentations between community clinics and randomized trial settings. To enter the original CBIT efficacy study, patients had to have a certain level of tic severity in order to qualify for participation. In contrast, the current study did not require patients to meet a certain level of symptom severity at the start of treatment. Thus, it is plausible that people who would not meet criteria for efficacy studies due to low tic severity went through treatment at this clinic. If this were the case, those in the clinic may exhibit less tic severity and impairment and thus require fewer sessions. This hypothesis is substantiated by empirical evidence, indicating that the mean PTQ score prior to treatment was 26.8 within the current clinical sample, while it was 34.2 for the CBIT group, reported by Piacentini et al. (2010).

Fourth, it is possible that differences in the cost of treatment in the two settings may have impacted session attendance. In a typical clinical setting, patients and their families must pay to participate in therapy, while the recruitment procedures in CBIT efficacy research (Piacentini et al., 2010; Wilhelm et al., 2012) provided treatment for free. Research indicates that paying for therapy sessions enhances patient involvement in the therapeutic process (David, 1964; Goodman, 1960; Gumina, 1977). The observation is significant as it suggests that patients in clinical settings may show accelerated responsiveness to treatment compared to those on whom the CBIT manual was standardized, highlighting the potential positive impact of payment for treatment on
patient motivation and leading to faster successful outcomes beyond manual indications.

*Hypothesis 3*

Hypothesis 3 examined the relationships between age and sex at birth and reductions in tic severity associated with CBIT. Age was not found to be related to change in tic severity, findings similar to those by Sukhodolsky et al. (2017), who found that age did not predict or moderate any CBIT outcomes in an efficacy study. Although these results suggest that CBIT is similarly effective across ages, the present investigation exclusively involved individuals within the school-aged children and teenage demographic. Consequently, the findings of this study are applicable solely to these age cohorts, with no generalizability to the adult population.

With respect to participant sex at birth, results of this study also parallel results of the study conducted by Sukhodolsky et al. (2017), showing that participant sex does not predict differential CBIT outcomes. Although the current study is the first effectiveness study to explore differential outcomes by participant sex, limitations do exist. First, it is important to note the differences in sample sizes between male (n=39) and female (n=14) participants in this study. Such differences raise concerns regarding the potential for confounding effects on treatment outcomes. Disparate sample sizes can introduce bias and hinder the ability to draw accurate conclusions, thus jeopardizing the reliability and validity of the study's findings (Diester et al., 2019). For example, unequal sample sizes may skew results, impeding the study's credibility and casting doubt on the accuracy of study conclusions and making it more likely that the results do not accurately represent the broader population. However, it's important to note that the sample sizes in this study reflect the broader population, as research indicates a male-to-female diagnostic ratio of
4:1 (Scahill et al., 2014; Scharf et al., 2015). Future research should be conducted with more equal distribution of men and women. Another noteworthy limitation is the limited age distribution represented in the study. The current investigation exclusively explores the age demographic of patients ranging from 5 to 19 years. This limited age scope not only confines the generalizability of the study across age categories but also constrains its capacity to comprehensively address potential sex-based disparities, given previous research indicating age-related differences in tic manifestation (Baizabal-Carvallo and Jankovic, 2022; Dy-Hollins et al., 2024) and reporting heightened tic severity in adult women compared to men (Girgis et al., 2022). Therefore, increasing the number of adult participants and having a more equal sex-distribution, would allow the study to more comprehensively study the relationship between age and sex may have with CBIT outcomes.

Study Strengths

Despite the acknowledged limitations, the present study has several notable strengths. First, this study investigated the effectiveness of CBIT with a substantially larger sample size of individuals who underwent the treatment in a standard outpatient setting, than any other CBIT effectiveness study before it. This approach enhances the robustness of the study's findings and contributes to the existing literature by providing a more comprehensive understanding of CBIT outcomes.

Second, a significant portion of the clinic's therapists were trainees, comprised primarily of newer graduate students undergoing CBIT training, alongside some highly experienced CBIT practitioners. This amalgamation of expertise levels underscores the diversity in training within the study. Such diversity highlights the potential effectiveness
of CBIT across a broad spectrum of therapist backgrounds. It is worth noting that while many clinicians in the clinic had limited prior clinical experience, they received consistent supervision and training from a highly experienced CBIT clinician. Therefore, future research should explore whether CBIT outcomes remain successful with a minimally trained population receiving less supervision and training.

This study makes a distinctive contribution to the existing literature by deviating from the common practice of exclusively enrolling individuals into treatment who had already been diagnosed with TDs. Whereas previous efficacy studies (Piacentini et al., 2010; Wilhelm et al., 2012) enrolled only those with PTDs, clinic patients in this study had a variety of provisional and persistent tic disorder diagnoses. This departure is especially significant, considering the demographic composition of the patients in the study. It was reported that 9 of the participants in the study were diagnosed with provisional tic disorder, as opposed to PTD, making them part of a population that has been historically excluded from CBIT research.

**Clinical Implications**

This study demonstrated a significant reduction in both tic severity and perceived tic-related distress from pre- to post-CBIT treatment within a clinical setting. These results align with previous efficacy and effectiveness studies of CBIT (Andrén et al., 2021; Dreison and Lagges, 2017; Piacentini et al., 2010; Rowe et al., 2013; Wilhelm et al., 2012), indicating that CBIT not only produces significant changes in ideal circumstances but also in a real-world clinical sample where therapists are trained to implement CBIT in a manner consistent with the protocol's recommendations.
Moreover, the study identified variations in the number of sessions administered during the treatment course compared to the standard protocol. Such findings suggest that CBIT continues to significantly impact treatment outcomes, even when diverging from the comprehensive application of the CBIT protocol. This highlights the adaptability of CBIT to individualized patient needs and indicates that the full 11 sessions detailed in the CBIT protocol may not be universally necessary. Further research is warranted to identify the essential components of the CBIT protocol and understand the key drivers of therapeutic change. Nevertheless, recognizing the effectiveness of treatment individualization represents a significant stride in optimizing CBIT's clinical application. Additionally, the study's findings regarding age and sex differences underscore the robust effectiveness of CBIT across diverse patient demographics. While a larger population size in future research would strengthen these claims, no clear associations were discerned in this study due to the limited diversity in age and sex.

**Conclusion**

In summary, this study underscores the effectiveness of CBIT when administered, based on the CBIT manual (Woods et al., 2008) in a university-based clinic, showing increasing evidence that CBIT is not only impactful when administered under ideal circumstances, but also impactful when administered under the relatively uncontrolled conditions of a “real-world” clinic. Future research endeavors should delve into identifying specific components of CBIT that contribute most significantly to treatment outcome changes. Additionally, exploring the variations in CBIT outcomes across diverse populations would be insightful. Extending the investigation to encompass adults undergoing CBIT in a clinical setting would provide a valuable extension of knowledge.
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Figure 1

*PTQ Scores Pre-Post CBIT*

![Bar chart showing PTQ scores pre and post CBIT with means and error bars.](image)
Figure 2

Tic-related SUDS Scores Pre-Post CBIT

![Bar chart showing tic-related SUDS scores pre and post CBIT intervention. The chart indicates a significant reduction in SUDS scores post-intervention, with M = 4.8 pre and M = 2.72 post. Error bars represent 95% CI.]
Figure 3

Correlation Patient Age and PTQ Reduction Pre-Post CBIT
Figure 4

PTQ Scores Pre-Post CBIT Stratified by Sex at Birth

PTQ Scores

Pre  Post

Child_Sex

Female

M = 31.7

M = 25.4

M = 18.7

M = 16.9

Error bars: 95% CI
Figure 5

Study Participant Flowchart

Patients who scheduled first appointment (N=69)

Excluded from Hypothesis 1a Analysis
Did not complete two PTQs over the course of treatment (n = 16)

Excluded from Hypothesis 1b Analysis
Did not complete two SUDS over the course of treatment (n=25)

Excluded from Hypothesis 3a Analysis
Did not complete two PTQs over the course of treatment (n = 16)

Excluded from Hypothesis 3b Analysis
Did not complete two PTQs over the course of treatment (n = 16)
Table 1

Clinic Patient Demographics Characteristics

<table>
<thead>
<tr>
<th>Sample Characteristics</th>
<th>n (%)</th>
<th>M(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>47(68.1)</td>
<td>11.01(3.38)</td>
</tr>
<tr>
<td>Sex at Birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>22(31.9)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>47(68.1)</td>
<td></td>
</tr>
<tr>
<td>Race and Ethnicity</td>
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<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>44(63.8)</td>
<td></td>
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<tr>
<td>Black/African American</td>
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<td></td>
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<tr>
<td>Hispanic/Latino</td>
<td>2(2.9)</td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>2(2.9)</td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
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<td></td>
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<tr>
<td>Other</td>
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<tr>
<td>Not Reported</td>
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<td></td>
</tr>
<tr>
<td>Tic Disorder Diagnosed</td>
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<td></td>
</tr>
<tr>
<td>Persistent Tic Disorders</td>
<td>34(49.3)</td>
<td></td>
</tr>
<tr>
<td>Provisional Tic Disorder</td>
<td>9(13.0)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>26(37.7)</td>
<td></td>
</tr>
<tr>
<td>Age of Tic Disorder Onset</td>
<td></td>
<td>7.88(3.59)</td>
</tr>
<tr>
<td>Previous Treatment for Tic Disorders Received</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapy &amp; other</td>
<td>8(10.7)</td>
<td></td>
</tr>
<tr>
<td>Medication &amp; other</td>
<td>2(2.7)</td>
<td></td>
</tr>
<tr>
<td>Medication &amp; therapy</td>
<td>1(1.3)</td>
<td></td>
</tr>
<tr>
<td>Medication</td>
<td>7(9.3)</td>
<td></td>
</tr>
<tr>
<td>Therapy</td>
<td>8(10.7)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2(2.7)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>1(1.3)</td>
<td></td>
</tr>
<tr>
<td>Diagnosed with Comorbidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>27 (39.1)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>42 (60.9)</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix A
### Child Demographic Form

1. Child’s Date of Birth
   
   _______/_______/_____________

<table>
<thead>
<tr>
<th>MM</th>
<th>DD</th>
<th>YYYY</th>
</tr>
</thead>
</table>

2. _______ Child’s Age:

3. _______ Child’s Sex:
   1 = Male
   2 = Female

   _______ Child’s Gender:
   1 = Male
   2 = Female
   3 = Non-binary / third gender
   4 = Prefer not to say

   _______ Child’s Pronouns:

4. _______ Is Child right or left-handed?
   1 = Right
   2 = Left
   3 = Mixed

5. _______ Is Child Hispanic or Latino?
   1 = Yes
   2 = No

---

In the child’s usual living arrangement, indicate who is fulfilling the role of the child’s mother:

8A. _________: Age:___________
   1 = Biological Mother
   2 = Step-mother
   3 = Adoptive mother
   4 = Grandmother
   5 = Other female relative
   6 = Other female non-relative
   7 = None

In the child’s usual living arrangement, indicate who is fulfilling the role of the child’s father:

8B. _________: Age:___________
   1 = Biological Father
   2 = Step-father
   3 = Adoptive father
   4 = Grandfather
   5 = Other male relative
   6 = Other male non-relative
   7 = None

Give the number of each of the following in the child’s usual living arrangement. (If joint custody where there are two “parental homes” give information about
6. _______ Child’s Race
1 = White
2 = Black or African American
3 = Asian
4 = American Indian/Alaskan Native
5 = Native Hawaiian or Other Pacific Islander
6 = Other Race (Specify) ___________________
7 = Mixed (Specify) ____________________

7. _______ Child’s Usual Living Arrangement
1 = Parental Home (At Least One Parent)
2 = Relative (Other Than Parents)
3 = With Unrelated Adults
4 = Shared apartment/residence with parents’ friends
5 = Shelter/street/homeless/transient
6 = Unknown
7 = Other (Specify) ____________________

11. _______ Child’s Current Grade

12. _______ Resource, Remedial, or Special Classes
1 = Yes
2 = No

13. _______ Current School Performance

the one where the child spends most of their time)

9A. _______ Brothers (Include Full, Half, Step, and Adopted)
9B. _______ Sisters (Include Full, Half, Step, and Adopted)
9C. _______ Other Relatives (Include Aunts, Uncles, and Cousins)
9D. _______ Non-Relative (Include Foster siblings and Friends)

10. _______ Type of Educational Activity the Child Attends (Choose only one)
1 = Public School
2 = Private School
3 = Special Education (Public or Private)
4 = Other (Specify) ____________________

17A. _______ Mother/Mother Figure’s Highest Level of Education:
1 = Eighth grade or less
2 = Some high school
3 = High school graduate or GED
4 = Technical/trade school or some college
5 = College graduate or equivalent (B.A., B.S.)
6 = Advanced graduate or professional degree (M.A., Ph.D., M.D., J.D.)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>17B. Father/Father Figure’s Highest Level of Education:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 = Eighth grade or less</td>
</tr>
<tr>
<td>14A. Mother/Mother Figure’s Current Employment Status</td>
<td></td>
<td>1 = Working full time (35 hours or more a week at one or more jobs)</td>
</tr>
<tr>
<td>14B. Father/Father Figure’s Current Employment Status</td>
<td></td>
<td>1 = Working full time (35 hours or more a week at one or more jobs)</td>
</tr>
<tr>
<td>18. Estimated Household Income (before Taxes from all Paid Employment in the Last 12 Months (include any tips, bonuses, or commission)</td>
<td></td>
<td>1 = $14,999 or less</td>
</tr>
<tr>
<td>19. What is the parents’ (parental figures’) current marital status?</td>
<td></td>
<td>1 = Married/Common Law</td>
</tr>
</tbody>
</table>
7 = Retired
8 = Student, full time
9 = Student, part time
10 = Other: (Specify) ____________________

For the Following Questions, Consider
The Current Household
15A. Mother/Mother Figure’s Occupation

_______________________________________

15B. Father/Father Figure’s Occupation

_______________________________________

16. ________ Does Any Part of the Family Income Come from Public Assistance?
1 = Yes
2 = No

23B. ________ Onset age

23C. ________ Treatment received
1 = Therapy & other
2 = Medication & other
3 = Medication & therapy
4 = Medication
5 = Therapy
6 = Other (describe): ____________________
7 = None

5 = Widowed
6 = Never married, not living with someone

20. ________ If married or living together, enter number of years

21. ________ How many parent (or parental figure) separations or divorces has the child experienced?

22. ________ If the child was in foster care, how many different homes was he/she in prior to yours?

23A. ________ Has your child ever been diagnosed as having Tourette’s Disorder or a motor/vocal tic disorder?
1 = Yes
2 = No

26C. ________ Treatment received
1 = Therapy & other
2 = Medication & other
3 = Medication & therapy
4 = Medication
5 = Therapy
6 = Other (describe):
_________________________
7 = None
<table>
<thead>
<tr>
<th>Question</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>24A. _______ Has your child ever been diagnosed as having obsessive compulsive disorder (OCD)?</td>
<td>1 = Yes</td>
<td>2 = No</td>
<td></td>
</tr>
<tr>
<td>24B. _______ Onset age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24C. _______ Treatment received</td>
<td>1 = Therapy &amp; other</td>
<td>2 = Medication &amp; other</td>
<td>3 = Medication &amp; therapy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>25A. _______ Has your child ever been diagnosed as having an anxiety disorder?</td>
<td>1 = Yes</td>
<td>2 = No</td>
<td></td>
</tr>
<tr>
<td>If yes, please specify:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25B. _______ Onset age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25C. _______ Treatment received</td>
<td>1 = Therapy &amp; other</td>
<td>2 = Medication &amp; other</td>
<td>3 = Medication &amp; therapy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>27A. _______ Has your child ever been diagnosed as having Attention Deficit/Hyperactivity Disorder (ADD/ADHD)?</td>
<td>1 = Yes</td>
<td>2 = No</td>
<td></td>
</tr>
<tr>
<td>If yes, please specify:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27B. _______ Onset age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27C. _______ Treatment received</td>
<td>1 = Therapy &amp; other</td>
<td>2 = Medication &amp; other</td>
<td>3 = Medication &amp; therapy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>28A. _______ Has your child ever been diagnosed as having an eating disorder?</td>
<td>1 = Yes</td>
<td>2 = No</td>
<td></td>
</tr>
<tr>
<td>If yes, please specify:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28B. _______ Onset age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28C. _______ Treatment received</td>
<td>1 = Therapy &amp; other</td>
<td>2 = Medication &amp; other</td>
<td>3 = Medication &amp; therapy</td>
</tr>
<tr>
<td>2 = Medication &amp; other</td>
<td>5 = Therapy</td>
<td></td>
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<td>------------------------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = Medication &amp; therapy</td>
<td>6 = Other (describe):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 = Medication</td>
<td>__________________________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 = Therapy</td>
<td>7 = None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 = Other (describe):</td>
<td>29A. ______ Has your child ever been diagnosed as having Alcohol or Drug Abuse?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 = None</td>
<td>1 = Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26A. ______ Has your child ever been diagnosed as having Violent Behavior?</td>
<td>2 = No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, please specify:</td>
<td>If yes, please specify:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>__________________________</td>
<td>__________________________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Yes</td>
<td>29B. ______ Onset age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = No</td>
<td>29C. ______ Treatment received</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26B. ______ Onset age</td>
<td>1 = Therapy &amp; other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. ______ What type of tic disorder has your child been diagnosed with?</td>
<td>2 = Medication &amp; other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Tourette’s Disorder</td>
<td>3 = Medication &amp; therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Persistent (Chronic) Motor Tic Disorder</td>
<td>4 = Medication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = Persistent (Chronic) Vocal Tic Disorder</td>
<td>5 = Therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 = Provisional Tic Disorder</td>
<td>6 = Other (describe):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 = Tic Disorder - Unspecified</td>
<td>__________________________</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7 = None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Medical History (0=No, 1=Yes)**

1. **Perinatal insult or serious neonatal illness**
   
   If Yes = 1, describe __________________________

2. **Pulmonary (including asthma)**

3. **Cardiovascular (including high blood pressure)**

4. **Heart Murmur**
5. Renal _____________________________________________________ 5.
8. Endocrine/Metabolic (including diabetes) ______________________ 8.
11. Neurologic (other than ADHD or tics) _________________________ 11.
12. Head Injury______________________________________________ 12.
15. Gynecologic______________________________________________ 15.
16. Psychiatric (other than OCD)_______________________________ 16.
17. Major Surgeries____________________________________________ 17.

22. COMMENTS:

________________________________________________________________________

________________________________________________________________________

MEDICATIONS

Please review carefully and complete the following medications chart. Check all medications that you have ever taken and/or are currently taking. (Note: The drug chart includes names from both Europe and North America)
<table>
<thead>
<tr>
<th>Medication</th>
<th>Ever Taken?</th>
<th>Indication</th>
<th>Start Date</th>
<th>Stop Date</th>
<th>Dose (in mg)</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 = Tics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 = Depression</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>4 = ADHD</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>5 = OCD</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>6 = Sleep Difficulties</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>7 = Other (Specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 = Unknown</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Neuroleptics:**

1. Haloperidol (Haldol)  
   - Ever Taken?: YES  
   - Benefit: 1 = much worse

2. Fluphenazine (Prolixin)  
   - Ever Taken?: YES

3. Pimozide (Orap)  
   - Ever Taken?: YES

4. Other  
   - Ever Taken?: YES

**Atypical Neuroleptics:**

5. Olanzapine (Zyprexa)  
   - Ever Taken?: YES

6. Quetiapine (Seroquel)  
   - Ever Taken?: YES

7. Risperidone (Risperidal)  
   - Ever Taken?: YES

8. Ziprasidone (Geodon)  
   - Ever Taken?: YES
<table>
<thead>
<tr>
<th>Medication</th>
<th>Ever Taken?</th>
<th>Indication</th>
<th>Start Date MM/YEAR</th>
<th>Stop Date MM/YEAR</th>
<th>DOSE</th>
<th>Benefit (0=worsened, 1=improved, 4=unchanged, 9=uncertain)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SRIs:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11. Citalopram (Celexa)</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Clomipramine (Anafranil)</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Fluoxetine (Prozac)</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Fluvoxamine (Luvox)</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Paroxetine (Paxil)</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Sertraline (Zoloft)</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Other</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Antidepressants:</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Bupropion (Welbutrin)</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Mirtazapine (Remeron)</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Nefazadone (Serzone)</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Nortriptyline (Pamelor)</td>
<td>YES</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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</tbody>
</table>
|---|---
| 22. Venlafaxine (Effexor) | Y N |
| 23. Strattera | Y N |
| 24. Other | Y N |

**Psychostimulants:**

<table>
<thead>
<tr>
<th></th>
<th>YES NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. Amphetamine (Dexedrine, Adderall)</td>
<td>Y N</td>
</tr>
<tr>
<td>26. Methylphenidate (Ritalin, Concerta, Metadate)</td>
<td>Y N</td>
</tr>
<tr>
<td>27. Pemoline (Cylert)</td>
<td>Y N</td>
</tr>
</tbody>
</table>

**Alpha agonists:**

<table>
<thead>
<tr>
<th></th>
<th>YES NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. Clonidine (Catapres)</td>
<td>Y N</td>
</tr>
<tr>
<td>29. Guanfacine (Tenex)</td>
<td>Y N</td>
</tr>
</tbody>
</table>

**Medication Ever Taken?**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Ever Taken?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood stabilizers:</td>
<td>YES NO</td>
</tr>
<tr>
<td>30. Carbamazepine (Tegretol)</td>
<td>Y N</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>31. Gabapentin (Neurontin)</td>
<td>Y</td>
</tr>
<tr>
<td>32. Lamotrigine (Lamictal)</td>
<td>Y</td>
</tr>
<tr>
<td>33. Lithium carbonate</td>
<td>Y</td>
</tr>
<tr>
<td>34. Oxcarbazepine (Trileptal)</td>
<td>Y</td>
</tr>
<tr>
<td>35. Tiagabine (Gabatril)</td>
<td>Y</td>
</tr>
<tr>
<td>36. Topiramate (Topomax)</td>
<td>Y</td>
</tr>
<tr>
<td>37. Valproic acid (Depakote, Depakene)</td>
<td>Y</td>
</tr>
<tr>
<td>38. Other</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Benzodizepines:**

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>39. Clonazepam (Klonopin)</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Lorazepam (Ativan)</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Other</td>
<td>Y</td>
<td>N</td>
<td></td>
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**Injections:**

<table>
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<tr>
<th></th>
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<th>NO</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>42. Botulinum toxin (Botox)</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Unclassified:</td>
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</tr>
<tr>
<td>43. Pergolide</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Permax)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>44. Other 1:</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Other 2:</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Appendix B

PARENT TIC QUESTIONNAIRE

For each of the tics listed below, please mark “YES” or “NO” as to whether or not your child has had the tic in the past week.

For each tic you mark as “YES”, please mark how FREQUENTLY the tic occurred over the past week, according to the following:

- **C** onstant, almost all the time during the day
- **H** ourly, at least once per hour
- **D** aily, at least several times per day
- **W** eekly, just a few times or less

Under **INTENSITY**, rate how intense you believe the tic felt to your child over the past week. For example, if it was very mild, like a weak twitch, that would be a “1”. A much more forceful tic that would be very noticeable to others and may even be painful would be rated as a “3” or even higher. Any tic that would be obviously noticeable to others should be rated as at least a “2”.

<table>
<thead>
<tr>
<th>Motor Tics</th>
<th>Present</th>
<th>Frequency</th>
<th>Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>C  H  D  W</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0</td>
<td>4  3  2  1</td>
</tr>
<tr>
<td>Eye Blinking</td>
<td>☐</td>
<td>☐</td>
<td>C  H  D  W</td>
</tr>
<tr>
<td>Eye rolling/darting</td>
<td>☐</td>
<td>☐</td>
<td>C  H  D  W</td>
</tr>
<tr>
<td>Head Jerk</td>
<td>☐</td>
<td>☐</td>
<td>C  H  D  W</td>
</tr>
<tr>
<td>Facial Grimace</td>
<td>☐</td>
<td>☐</td>
<td>C  H  D  W</td>
</tr>
<tr>
<td>Mouth/Tongue Movements</td>
<td>☐</td>
<td>☐</td>
<td>C  H  D  W</td>
</tr>
<tr>
<td>Shoulder Shrugs</td>
<td>☐</td>
<td>☐</td>
<td>C  H  D  W</td>
</tr>
<tr>
<td>Chest/stomach tightening</td>
<td>☐</td>
<td>☐</td>
<td>C  H  D  W</td>
</tr>
<tr>
<td>Pelvic Tensing Movements</td>
<td>☐</td>
<td>☐</td>
<td>C  H  D  W</td>
</tr>
</tbody>
</table>
PARENT TIC QUESTIONNAIRE

**FREQUENCY**:  Constant: almost all the time during the day, Hourly: least once per hour,
Daily: at least several times per day, Weekly: just a few times or less

**INTENSITY**:  Mild: 1, Obvious to others: 2, Very noticeable or painful: 3 or higher.

<table>
<thead>
<tr>
<th>Vocal Tics</th>
<th>Present</th>
<th>Frequency</th>
<th>Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>C H D W</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0</td>
<td>4 3 2 1</td>
</tr>
<tr>
<td>Grunting</td>
<td>□</td>
<td>□</td>
<td>C H D W</td>
</tr>
<tr>
<td>Sniffing</td>
<td>□</td>
<td>□</td>
<td>C H D W</td>
</tr>
<tr>
<td>Snorting</td>
<td>□</td>
<td>□</td>
<td>C H D W</td>
</tr>
<tr>
<td>Coughing</td>
<td>□</td>
<td>□</td>
<td>C H D W</td>
</tr>
<tr>
<td>Animal Noises</td>
<td>□</td>
<td>□</td>
<td>C H D W</td>
</tr>
<tr>
<td>Syllables</td>
<td>□</td>
<td>□</td>
<td>C H D W</td>
</tr>
<tr>
<td>Words</td>
<td>□</td>
<td>□</td>
<td>C H D W</td>
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<tr>
<td>Category</td>
<td>Rating</td>
<td>C</td>
<td>H</td>
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<td>--------------------------------------</td>
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<tr>
<td>Phrases</td>
<td>□</td>
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<tr>
<td>Echolalia (repeating vocalizations of others)</td>
<td>□</td>
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<tr>
<td>Coprolalia (obscene words)</td>
<td>□</td>
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<tr>
<td>Blocking/stuttering</td>
<td>□</td>
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<tr>
<td>Other</td>
<td>□</td>
<td></td>
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<tr>
<td>Other Vocal Tics</td>
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<tr>
<td>Complex Vocal Combinations</td>
<td>□</td>
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</tbody>
</table>

**Office Use Only:**

- Sum of Motor Tic Scores: __________
- Sum of Vocal Tic Scores: __________
- Sum of all Scores (Motor & Vocal): __________
Appendix C

SUBJECUTIVE UNITS OF DISTRESS SCALE

**Instruction:** Provide a Subjective Units of Distress (SUDS) rating for each symptom listed on the Initial Symptom Hierarchy at the beginning of each treatment session. These ratings are to be completed with the patient. New symptoms can be added to the bottom of the list. Do not drop any previously reported symptoms. Symptoms reported as no longer present or not currently distressing are to be rated as “0.” **Please note the week that TX was begun for each symptom by circling the SUDS rating for that week.**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>SUDS Rating</th>
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<tbody>
<tr>
<td>Session #:</td>
<td></td>
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<tr>
<td>Date:</td>
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<td>1.</td>
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<td>12.</td>
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<td>16.</td>
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<td>17.</td>
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<td>18.</td>
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