Tic-Related Obsessive-Compulsive Disorder (OCD): Phenomenology and Treatment Outcome in the Pediatric OCD Treatment Study II

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Objective: Prior research has shown that youth with co-occurring tic disorders and obsessive-compulsive disorder (OCD) may differ from those with non–tic-related OCD in terms of clinical characteristics and treatment responsiveness. A broad definition of "tic-related" was used to examine whether children with tics in the Pediatric OCD Treatment Study II differed from those without tics in terms of demographic and phenomenological characteristics and acute treatment outcomes. **Method:** Participants were 124 youth aged 7 to 17 years, inclusive, with a primary diagnosis of OCD who were partial responders to an adequate serotonin reuptake inhibitor (SRI) trial. Participants were randomized to medication management, medication management plus instructions in cognitive-behavioral therapy (CBT), or medication management plus full CBT. Tic status was based on the presence of motor and/or vocal tics on the Yale Global Tic Severity Scale. **Results:** Tics were identified in 53% of the sample. Those with tic-related OCD did not differ from those with non–tic-related OCD in terms of age, family history of tics, OCD severity, OCD-related impairment, or comorbidity. Those with tics responded equally in all treatment conditions. **Conclusion:** Tic-related OCD was very prevalent using a broad definition of tic status. Results suggest that youth with this broad definition of tic-related OCD do not have increased OCD severity or inference, higher comorbidity rates or severity, or worsened functioning, and support the use of CBT in this population. This highlights the importance of not making broad assumptions about OCD symptoms most likely to occur in an individual with comorbid tics. Clinical trial registration information—Treatment of Pediatric OCD for SRI Partial Responders; http://clinicaltrials.gov; NCT00074815. J. Am. Acad. Child Adolesc. Psychiatry, 2014;53(12):1308–1316. **Key Words:** tic, obsessive-compulsive disorder, tic-related OCD, treatment

Obsessive-compulsive disorder (OCD) is clinically heterogeneous. A new diagnostic subtype for OCD in *DSM-5* is tic-related OCD, which occurs in individuals with a lifetime history of tic disorder.[1] This subtype is estimated to occur in 10% to 40% of OCD cases diagnosed in childhood.[2]

Tic-related OCD may differ from non–tic-related OCD across a number of demographic and phenomenological variables. Those with tic-related OCD may be more likely to be male[3,4] and to have an earlier age of OCD onset.[4,5] Data also suggest that tic-related OCD is highly familial.[6] In terms of co-occurring psychopathology, data are mixed. One study suggested that individuals with tic-related OCD exhibit more aggression problems than those with OCD alone.[7] Another study found no such effect,[8] and in that study, those with tic-related OCD were less likely than those with OCD alone to have problems with attention-deficit/hyperactivity disorder (ADHD).

Although those with tic-related OCD have been characterized as having different OCD symptoms,[2] data are mixed, especially in youth samples. Zohar *et al.*[9] reported that obsessional content discriminated adolescents with tic-related OCD from adolescents with OCD, in that those with tic-related OCD endorsed more aggressive obsessions, whereas others in the sample

endorsed more sexual obsessions. In contrast, in a sample of children and adolescents,[10] topography of compulsions, but not obsessions, discriminated those with tic-related OCD. Individuals with tic-related OCD were more likely to endorse ordering, hoarding, and washing/cleaning compulsions. In a third study examining OCD symptom topography in youth, those with tic-related OCD were more likely to endorse contamination obsessions, sexual obsessions, and counting compulsions than the rest of the sample.[11]

Thus, although tic-related OCD has been defined, in part, by differences in OCD symptom topography, data in youth samples are widely divergent. The reasons for these discrepancies are unclear and could potentially be attributable to method variance (e.g., categorization of tic-related OCD or OCD symptom subtypes[12]) or recruitment biases (e.g., secondary analyses of studies focused on OCD vs. tics). However, 1 consistent finding across the aforementioned and other[8] studies is that persons with tic-related OCD do not differ in terms of OCD symptom severity.

It also remains unclear whether tics are associated with a differential response to OCD treatment. Some have argued that tic-related OCD necessitates adaptation of pharmacotherapy and cognitive-behavioral therapy (CBT) based on the premise that these individuals are more difficult to treat, more susceptible to premature termination, and more likely to be treatment refractory.[13] For example, Mansueto and Keuler[13] advocated for augmentation of serotonin reuptake inhibitor (SRI) treatment with low-dose neuroleptics or α_2 agonists and CBT modification to include longer sessions, more rote practice of skills, relaxation techniques, and substitution strategies. This question of differential treatment response has been examined in only a few studies. In the POTS trial, participants with tics did not benefit from sertraline monotherapy (i.e., equivalent response between sertraline and placebo), whereas those without tics did benefit from sertraline monotherapy.[14] In that same study, no difference was found in response to CBT or combined treatment. Two other studies suggest that youth with OCD and tics equally benefit from CBT alone.[15,16] Medication trials have shown that tic-related OCD is associated with a lower response rate to paroxetine[17] and fluvoxamine.[18] Notably, some data suggest that individuals with tic-related OCD may be more likely than those without tic-related OCD to respond to neuroleptic augmentation of SRIs.[19]

This collective body of previous research has almost exclusively addressed the relationship between tics and OCD by defining tic status as meeting *DSM* criteria for a chronic tic disorder (persistent tic disorder, Tourette syndrome[1]). Given the inconsistent findings in the aforementioned research, it is still unclear if the presence of tics in those with OCD has clinical utility in terms of distinct OCD phenomenology and treatment responsiveness.

The use of strict *DSM* diagnostic categories as the basis for psychiatric research has increasingly recognized limitations, such as the marked heterogeneity and co-morbidity of disorders and artificial demarcation between disorders with shared underlying genetic, neurological, and behavioral processes.[20] As a consequence, some have advocated for a dimensional approach that includes those who experience significant disorder symptoms but may not meet usual diagnostic criteria.[20] Empirical study of these alternative phenotypes may help us to better understand etiology and phenomenology and to improve treatment.

Previous research indicates that a far greater number of children with OCD have a lifetime history of tics (nearly 60%) than meet full *DSM* criteria for a chronic tic disorder.[21] This high rate of co-occurrence is thought to be attributable to shared etiology involving dysfunction of the dopamine system and basal ganglia–thalamocortical circuits.[2,22] Research increasingly points to the importance of examining subtle or subthreshold motor dysfunction as a way of linking basal ganglia alterations to psychopathology.[23] These "motor phenotypes" have improved understanding of the phenomenology and longitudinal course of other disorders involving basal ganglia dysfunction, such as schizophrenia.[24] Applying a similarly broad "motor phenotype" approach may help yield a better understanding of the tic-OCD relationship. Indeed, a recent study that defined pediatric tic-related OCD more inclusively (co-occurrence with chronic tic disorders plus transient tic disorder and tic disorder not otherwise specified [NOS]) found greater error-related brain activity in non–tic-related than tic-related OCD.[25]

The aims of the current study were to use a broad definition of "tic-related OCD" to examine whether children with tics in the Pediatric OCD Treatment Study II (POTS II)[26] differ from those

with non–tic-related OCD in terms of demographic and phenomenological characteristics and acute treatment outcome. POTS II was a randomized controlled trial examining the efficacy of CBT augmentation strategies for youth who were partial responders to an optimal SRI dosage. Treatment conditions included medication management (MM), medication management plus CBT augmentation (MM+CBT), and medication management plus instructions in CBT (MM+iCBT). Primary outcomes indicated that participants receiving MM+CBT had significantly greater OCD symptom reduction compared to those with MM alone (ES = 0.85) and that participants receiving MM+iCBT did not show symptom reduction compared to those with MM alone (ES = 0.16). Importantly, results provided continued support for traditional CBT augmentation in a sample of partial responders and indicated limited support for an abbreviated version of CBT over medication management alone.

Tic-related OCD status was based on identification of tics on a clinician measure (Yale Global Tic Severity Scale [YGTSS][27]). Our approach was to see whether the mere presence of tics—an easily observable indicator of a putative neurobiological marker—could be clinically informative. We hypothesized that individuals with tic-related OCD would differ from those without tic-related OCD in terms of age, gender, OCD symptomology, and comorbidity. It was also hypothesized that individuals with tic-related OCD would exhibit a poorer treatment response compared to those without tic-related OCD.

METHOD

Study Design

POTS II was a 12-week randomized controlled trial examining the efficacy of CBT augmentation strategies for youth with primary OCD who were partial responders to an optimal SRI dosage. The study rationale, design, methods, baseline sample characteristics, and primary outcomes have been reported elsewhere.[26,28,29] POTS II participants were recruited from 3 sites (University of Pennsylvania [UPenn], Duke University, and Brown University) between 2004 and 2009 and randomized to 1 of 3 treatment strategies. In medication management only (MM; n = 42), participants received 7 visits with a study psychiatrist. Visits focused on SRI maintenance, monitoring of clinical status and medication effects, and general encouragement to resist OCD. A second group received medication management as in MM plus CBT augmentation (MM+CBT; n = 42) occurring in 14 hourly visits over 12 weeks from a second provider (a study psychologist). The CBT protocol was based on a published manual[30] and consisted of psychoeducation, cognitive training, and exposure with response prevention. The third group received medication management plus CBT augmentation from the same psychiatry provider, who also provided instructions in CBT skills (MM+iCBT; n = 40) across seven 45-minute sessions. iCBT included psychoeducation, hierarchy development, and exposure homework but did not include in-session exposures and didactic parent sessions. Study assessments were conducted by independent evaluators (psychologists with PhD degrees), who were blinded to treatment assignment of participants and who received training and supervision as described elsewhere.[28]

The institutional review board at each site approved the study protocol, and all participants and at least 1 of their parents provided written informed consent. The Consolidated Standards of Reporting Trials (CONSORT) diagram is reported in Franklin *et al.*[26]

Participants

POTS II participants were 124 youth between the ages of 7 and 17 inclusive with a primary diagnosis of OCD according to *DSM-IV* criteria, clinically relevant residual OCD symptoms (score of ≥16 on the CY-BOCS), partial response to an adequate SRI trial, and current outpatient treatment. Participants were excluded if OCD was not their primary diagnosis and if they had a pervasive developmental disorder (PDD), did not have an adequate SRI trial, had an adequate CBT trial (>10 sessions), were pregnant, had pediatric autoimmune neuropsychiatric disorders associated with streptococcal infection (PANDAS), or were taking more than 1 SRI concurrently. Eligibility was assessed using a multi-gate procedure.[26]

For the current study, participants were classified as having either tic-related OCD (Tic+OCD) or OCD without tics based on clinician identification of tics on the YGTSS, which was administered by the independent evaluator. Clinicians first administered the tic checklist to inquire about current and lifetime presence of tics and then completed a summary item identifying the type of tics endorsed (no tics, motor tics only, vocal tics only, motor, and vocal tics). Participants with motor, vocal, and both motor and vocal tics indicated on this YGTSS item were classified as having tic-related OCD. Criteria related to symptom duration and interference were not applied.

Measures

Demographics. Basic demographic information about the child's gender, age, and family history of tics and OCD were collected via parent report.

Anxiety Disorders Interview Schedule for Children (ADIS-C/P). The ADIS-C/P[31] is a psychometrically sound, structured diagnostic interview designed to assess *DSM-IV* childhood anxiety disorders and related mood and behavior disorders.

Yale Global Tic Severity Scale (YGTSS). The YGTSS[27] contains a checklist of simple and complex motor and vocal tics and a 5-item clinician-rated form of tic severity. Separate severity ratings are completed for motor and vocal tics; ratings are combined for a total tic severity score (range, 0–50). The YGTSS has demonstrated good convergent validity, discriminant validity, and interrater reliability.[32]

Children's Yale–Brown Obsessive-Compulsive Scale (CY-BOCS). The CY-BOCS[33] contains a checklist of obsessions and compulsions as well as a 10-item clinician-rated form of OCD symptom severity that incorporates clinical observation, parent report, and child report. Adequate reliability, validity, and sensitivity to change have been demonstrated.[33]

National Institutes of Mental Health–Global Obsessive Compulsive Scale (NIMH-GOCS). The NIMH-GOCS[34] measures OCD severity on a 1 ("minimal") to 15 ("very severe") scale based on symptom severity and functional impairment.

Clinical Global Impressions–Improvement Scale (CGI-I). The CGI-I[35] requires the clinician to classify the degree to which a patient has improved compared to an earlier point in time. Ratings range from 1 ("very much improved") to 7 ("very much worse"). This scale has been used successfully in patients with OCD.[36]

Children's OCD Impact Scale (COIS). In the COIS,[37] parallel child- and parent-report forms assess the impact of OCD on psychosocial functioning. Subscales measure Social Impact (7 items), School Impact (6 items), and Home/Family Impact (7 items). One additional item allows for a global interference rating. The COIS has demonstrated good internal consistency and convergent validity.[37]

Children's Depression Inventory (CDI). The CDI[38] is a 27-item child self-report measure of depressive symptomatology over the preceding 2 weeks and has shown adequate reliability and concurrent validity.[38] T scores are age and gender based, with scores above 65 indicating clinically significant symptoms.

Multidimensional Anxiety Scale for Children (MASC). The MASC[39] is a parallel child- and parent-report measure of emotional, cognitive, physical, and behavioral symptoms of anxiety, with acceptable psychometric properties.[39] T scores greater than 65 indicate clinically significant symptoms.

Conners' Parent Rating Scale–Revised—Long Version (CPRS-R-L). The CPRS-R-L[40] is a psychometrically sound, 80-item parent-report measure of ADHD symptoms and oppositional behavior. T scores greater than 60 indicate clinically relevant symptoms.

Pediatric Quality of Life Enjoyment and Satisfaction Questionnaire (PQ-LES-Q). The PQ-LES-Q[41] is a 15-item child self-report scale assessing satisfaction with life across a variety of functional domains. Items are rated from 1 (very poor) to 5 (very good) and summed to generate a total score, with higher scores indicating better quality of life. The PQ-LES-Q has demonstrated excellent internal consistency and sensitivity to change during treatment.

Analytic Plan

Potential group differences in terms of demographic variables, OCD symptomology, and co-occurring psychopathology were examined using descriptive analyses and group comparisons (independent t tests for continuous variables, χ^2 for categorical variables where all cells had $n \geq 10$, or Fisher's exact test for categorical variables where any cells had $n \leq 10$) of data collected during the pretreatment baseline evaluation. Treatment response was examined using several approaches. First, χ^2 analysis was used to examine whether those with tic-related OCD were more likely to prematurely terminate treatment (including investigator-initiated withdrawals and study drops). Second, repeated-measures analysis of variance was used to compare mean CY-BOCS change from pre- to posttreatment for those with and without tic-related OCD within each treatment arm. Third, treatment response status was examined by comparing the rate of participants with and without tics who both exhibited clinically significant change in CY-BOCS scores (reduction of at least 30%) and were classified as "much improved" or better at posttreatment (CGI-I score of 1 or 2). Statistical analyses were performed using SPSS 19 software (IBM).

RESULTS

Tics

Tics were identified in 66 of 124 participants (53.2%). Of those with tics, 27 (40.9%) had motor tics only, 5 (7.6%) had vocal tics only, and 34 (51.5%) had both. Of the children with tics, 35 (53.0%) had a history of only simple tics, whereas 31 (47%) had past or current complex tics. Tic severity ratings based on the "worst ever" period of tics were available for 59 children and indicated moderate tic severity (mean YGTSS Total Severity score = 18.38, SD = 11.03; mean YGTSS Motor Severity score = 11.21, SD = 5.99; and mean YGTSS Vocal Severity score = 7.10, SD = 6.83). Current tics (i.e., within the past week) were identified in 60 children. YGTSS scores for these 60 children indicated mild current tic severity (YGTSS Total Severity score = 10.3, SD = 8.86, YGTSS Motor Severity score = 6.68, SD = 5.21, YGTSS Vocal Severity score = 3.71, SD = 5.03).

Demographics

Participants did not differ by tic status with respect to age ($t = 0.19$, $p = .85$), sex ($\chi^2 = 2.21$, $p = .14$), or family history of tics ($\chi^2 = 0.14$, $p = .702$) or OCD ($\chi^2 = 0.51$, $p = .477$) (Table 1).

Baseline Psychopathology

Baseline characteristics are presented in Table 1.

OCD. Mean baseline CY-BOCS scores did not differ by tic status in terms of total severity ($t = 0.04$, $p = .96$), obsession severity ($t = 0.18$, $p = .86$), and compulsion severity ($t = 0.30$, $p = .76$). Rates of specific OCD symptoms endorsed on the CY-BOCS symptom checklist are presented in Figure 1. Participants with OCD only were more likely to experience religious obsessions ($\chi^2 = 6.05$, $p = .014$), washing compulsions ($\chi^2 = 5.15$, $p = .025$), and ordering compulsions ($\chi^2 = 5.45$, $p = .020$). No differences were found for other obsession or compulsion categories. Groups did not differ on the NIMH-GOCS ($t = 0.25$, $p = .81$), COIS-C ($t = 0.91$, $p = .37$), COIS-P ($t = 0.23$, $p = .81$), and CGI-S ($t = 0.92$, $p = .36$).

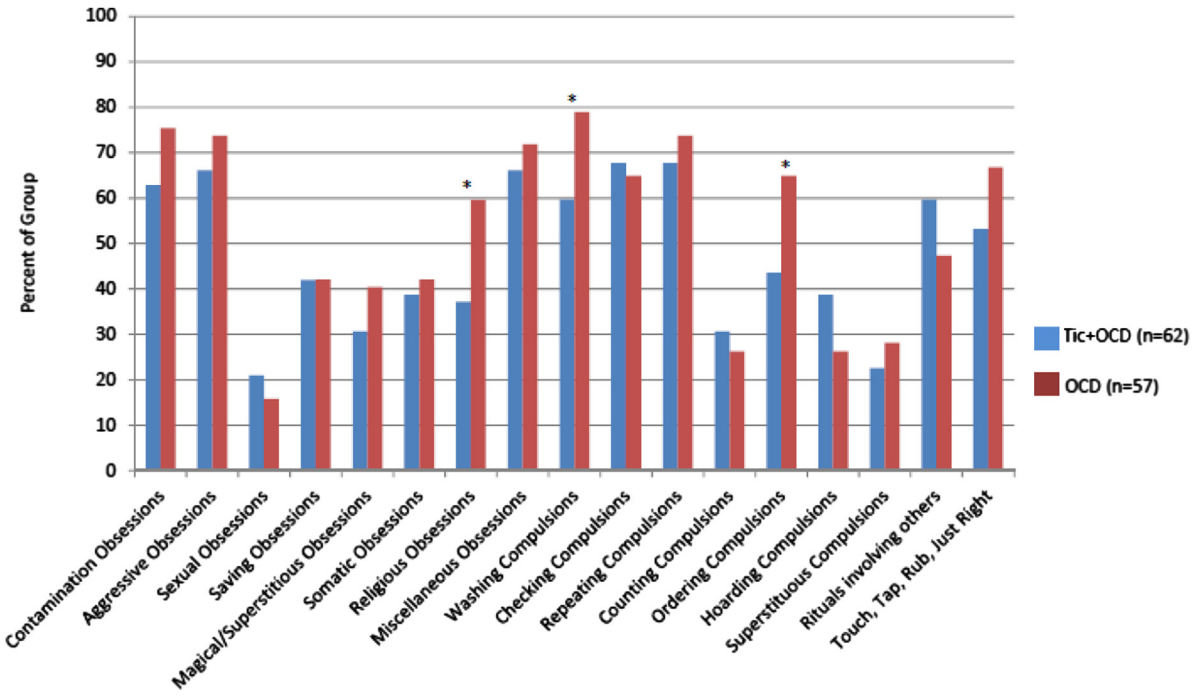
Comorbidity. The number of ADIS-C/P comorbid psychiatric diagnoses ($\chi^2 = 0.35$, $p = .54$) and the frequency of specific disorder clusters did not differ by tic status (Table 1). Comparisons of those with and without tics on dimensional measures of psychopathology revealed no significant differences in the severity of anxiety (MASC-C total: $t = 0.09$, $p = .93$; MASC-P total: $t = 0.88$, $p = .37$), depression (CDI: $t = 0.44$, $p = .66$), and ADHD symptoms (CPRS ADHD index: $t = 0.26$, $p = .79$). Global

TABLE 1 Baseline Characteristics of Study Participants

Characteristic	Tic + OCD (n = 66)		OCD (n = 58)		p
Study center					
Brown University	31		17		$\chi^2 = 9.12$, $p = .01$**
Duke University Medical Center	21		14		
University of Pennsylvania	14		27		
Age, y, mean (SD)	13.55	(2.78)	13.65	(2.77)	$t = 0.19$, $p = .85$
Sex, male (%)	35	(53.0)	23	(39.6)	$\chi^2 = 2.21$, $p = .14$
Weeks on SRI, mean (SD)	84.42	(81.68)	64.03	(60.93)	$t = 1.55$, $p = .12$
Family history of tics	7		8		Fisher's exact $p = .457$
Family history of OCD	16		12		Fisher's exact $p = .311$
OCD baseline severity, mean (SD)					
CY-BOCS total	24.86	(4.29)	24.82	(4.80)	$t = 0.048$, $p = .96$
CY-BOCS obsession total	11.89	(2.52)	11.98	(2.92)	$t = 0.18$, $p = .86$
CY-BOCS compulsion total	12.96	(2.24)	12.84	(2.48)	$t = 0.30$, $p = .76$
NIMH-GOCS	9.58	(1.63)	9.66	(1.94)	$t = 2.47$, $p = .81$
Clinical Global Impression Severity score	4.85	(0.89)	5.00	(0.90)	$t = 0.92$, $p = .36$
COIS-Parent	48.51	(8.90)	50.38	(11.43)	$t = 0.90$, $p = .37$
COIS-Child	53.71	(11.88)	53.13	(13.29)	$T = 0.23$, $p = .82$
Baseline comorbidities, n (%)					
Any (excluding tics)	41	(62.1)	33	(56.8)	$\chi^2 = 0.35$, $p = .55$
ADHD	14	(21.2)	13	(22.4)	$\chi^2 = 0.26$, $p = .87$
Anxiety/mood	30	(45.5)	25	(43.1)	$\chi^2 = 0.06$, $p = .79$
ODD	1	(0.01)	1	(0.01)	$\chi^2 = 0.008$, $p = .92$
Dimensional measures of comorbidity, mean (SD)					
MASC-C total	50.13	(12.55)	49.92	(12.88)	$t = 0.09$, $p = .93$
MASC-P total	52.15	(20.08)	48.80	(17.45)	$t = 0.88$, $p = .37$
CPRS ADHD Index	65.40	(11.98)	64.74	(13.25)	$t = 0.26$, $p = .79$
CDI total	52.53	(10.97)	51.50	(11.83)	$t = 0.44$, $p = .66$
CGAS	53.02	(9.38)	52.36	(11.06)	$t = 0.36$, $p = .72$
PQ-LES total	50.62	(9.21)	52.06	(9.73)	$t = 0.75$, $p = .45$

Note: ADHD = attention-deficit/hyperactivity disorder; CDI = Children's Depression Inventory; CGAS = Children's Global Assessment Scale; COIS = Children's OCD Impact Scale; CPRS = Conners' Parent Rating Scale—Revised—Long Version; CY-BOCS = Children's Yale—Brown Obsessive Compulsive Scale; MASC-C = Multidimensional Anxiety Scale for Children, Child-Report; MASC-P = Multidimensional Anxiety Scale for Children, Parent-Report; NIMH-GOCS = National Institutes of Mental Health—Global Obsessive Compulsive Scale; OCD = obsessive-compulsive disorder; ODD = oppositional defiant disorder; PQ-LES = Pediatric Quality of Life Enjoyment and Satisfaction Questionnaire; SRI = serotonin reuptake inhibitor.

FIGURE 1 Types of obsessive-compulsive symptoms endorsed on Children's Yale–Brown Obsessive Compulsive Scale (CY-BOCS) in Tic + OCD (obsessive-compulsive disorder) and OCD groups. *$p < .05$.



functioning measures also did not differ by tic status (PQ-LES total: $t = 0.75$, $p = .45$; CGAS: $t = 0.36$, $p = .72$).

Treatment Response

The frequency of tic-related OCD was found to differ by site ($\chi^2 = 9.12$, $p = .01$), such that participants were less likely to have tic-related OCD at the University of Pennsylvania (Table 1). There were no differences in the frequency of tic-related OCD by treatment group (MM: Tic+OCD n = 25; OCD n = 17; MM+iCBT: Tic+OCD n = 20, OCD n = 20; MM+CBT: Tic+OCD n = 21, OCD n = 21; $\chi^2 = 1.01$, $p = .60$).

Change in Study Status

Participants with tic-related OCD were no more likely to prematurely terminate treatment (n = 12) than those without tics (n = 11; $\chi^2 = 0.013$, $p = .911$). Fisher exact tests indicated that this equivalent rate of premature termination was consistent within each treatment condition (MM: Tic+OCD n = 6, OCD n = 6, $p = .498$; MM+iCBT: Tic+OCD n = 3, OCD n = 3, $p = .669$; and MM+CBT: Tic+OCD n = 3, OCD n = 2, $p = .500$).

CY-BOCS Change. Mean CY-BOCS scores for participants with and without tics in each treatment condition are presented in Table 2. Repeated-measures analysis of variance indicated that tic status was not associated with differential change on CY-BOCS scores at posttreatment in MM ($F_{1,36} = 0.015$, $p = .90$), MM+iCBT ($F_{1,31} = 1.73$, $p = .19$), or MM+CBT ($F_{1,37} = 0.006$, $p = .93$).

Responder Status. Participants with tic-related OCD were equally likely to experience clinically significant change on the CY-BOCS in all treatment conditions (Fisher's exact tests: MM: Tic+OCD n = 7, OCD n = 5, $p = .728$; MM+iCBT: Tic+OCD n = 3, OCD n = 6, $p = .259$; and MM+CBT: Tic+OCD n = 11, OCD n = 13, $p = .749$).

Participants with tic-related OCD were equally likely to be classified as "much improved" or better on the CGI-I (Tic+OCD n = 22, OCD n = 22, $\chi^2 = 3.05$, $p = .08$). Fisher's exact tests indicated that this equivalent rate of CGI-I classification was consistent within each treatment condition (MM: Tic+OCD n = 6, OCD n = 4, $p = .700$; MM+iCBT: Tic+OCD n = 4, OCD n = 8, $p = .157$; and MM+CBT: Tic+OCD $n = 12$, OCD n = 14, $p = .550$).

DISCUSSION

The current study used a broad definition of "tic-related OCD" to examine clinical characteristics

TABLE 2 Children's Yale–Brown Obsessive Compulsive Scale (CY-BOCS) Scores at 12 Weeks, by Treatment Group and Tic Disorder Status

		Baseline		Week 12	
Treatment Group	**n**	**Mean**	**(SD)**	**Mean**	**(SD)**
MM − Tic	17 (14 at 12 wk)	23.2	(5.4)	19.5	(8.4)
MM + Tic	25 (24 at 12 wk)	25.1	(4.8)	22.2	(7.0)
MM + iCBT −Tic	19 (17 at 12 wk)	26.4	(5.2)	19.2	(8.0)
MM + iCBT + Tic	20 (17 at 12 wk)	25.3	(3.7)	21.5	(6.5)
MM + CBT − Tic	21 (20 at 12 wk)	24.7	(3.5)	14.6	(9.1)
MM + CBT + Tic	21 (19 at 12 wk)	24.2	(4.3)	13.9	(7.8)

Note: CBT = cognitive-behavioral therapy; iCBT = medication management plus instructions in CBT; MM = medication management only.

and acute treatment outcome in youth with tics and OCD who participated in the POTS II trial. Overall, results suggest that individuals with tic-related OCD were generally no different from those with non–tic-related OCD in terms of demographic characteristics, OCD severity and phenomenology, comorbidity burden, and treatment outcome.

Tic status was classified based on current or lifetime presence of motor and/or vocal tics. Using this definition, tic-related OCD was highly prevalent, occurring in 53% of the sample. This is higher than the rate of tic disorders in this sample using ADIS-C/P-defined *DSM-IV* criteria (15.3%).[26] This finding is consistent with prior research suggesting that a high proportion of youth with OCD have a lifetime history of tics, and that definitions that rely on meeting full *DSM* criteria may underestimate tic co-occurrence.[22] It is also possible that the high tic rate in this sample reflects a greater prevalence of tics among individuals with OCD who are SRI partial responders.

Distinct demographic characteristics were not found in the tic-related OCD group. Findings contrast previous research indicating a male preponderance of both tics and tic-related OCD,[3,4] as well as research suggesting that those with tic-related OCD are more likely to have a first-degree relative with tics.[8] Discrepancies may reflect the unique nature of this sample. For example, females with tics may be more likely to be SRI partial responders, or parents in this sample may have been less likely to reveal tic history via self-report.

Clinical characteristics generally did not differ in the tic-related OCD group. Consistent with prior research in youth samples,[8] data indicate that those with tic-related OCD do not have increased OCD severity or interference, higher comorbidity rates or severity, or worsened global functioning. Some differences were found in OCD symptom topography, such that fewer participants in the tic-related OCD group had religious obsessions and washing and ordering compulsions. Whether these differences are clinically meaningful is unclear, especially when compared to prior data that reveal no consistent pattern of OCD content in those with tic-related OCD.[9-11] The convergence of findings seems to suggest that tic-related OCD is not indicative of particular OCD symptom profiles. Clinically, this highlights the importance of not making broad assumptions about the type of OCD symptoms that are most likely to occur in an individual with comorbid tics.

Tic-related OCD was not associated with differential treatment response. The tic-related OCD group was equally likely to respond in all treatment conditions and was no less likely to be treatment refractory or to terminate prematurely. In contrast to POTS I,[14] tics did not moderate medication management alone, which may be attributable to this sample being youth who were already medication partial responders, or to the more broad definition of tic-related OCD in the current study. The finding that individuals with tic-related OCD benefitted equally from CBT interventions is consistent with prior research[14-16] and further supports the use of CBT for youth with tic-related OCD. This also suggests that the new *DSM-5* tic-related OCD specifier may assist clinicians in characterizing OCD but may have less utility in terms of psychotherapy treatment selection. However, the way in which CBT is delivered may still require clinician expertise in both OCD and tics to ensure appropriate matching of CBT technique to symptoms (e.g., exposures to target core obsessional fears, competing responses to target tics).

Findings contrast some recommendations that those with tic-related OCD need modified CBT.[13] Our finding is not entirely unexpected, given CBT theory, which underlies psychotherapy of both tics and OCD.[42,43] This theory postulates that both tics and compulsions are maintained by negative reinforcement that occurs when the behavior alleviates the discomfort of private aversive experiences (premonitory urges or obsessions). CBT for OCD targets this process using exposures, which involve intentionally eliciting distress and resisting escape or avoidance behaviors (compulsions) so that natural habituation can occur. Exposure therapy has been shown to lead to reductions in tics and premonitory urges,[44] and a similar mechanism is thought to underlie behavior therapy for tics.[43] Therefore, if a child with tic-related OCD is struggling with CBT, or if tic and OCD symptoms are difficult to differentiate, modifications that tap CBT change mechanisms may be beneficial. For example, modifications that bolster the likelihood of habituation (e.g., longer sessions, more rote exposure practice) or distress tolerance (e.g., mindfulness) may be more helpful than strategies that counteract habituation or emphasize escape from negative affect (e.g., relaxation).

The current study has several limitations. First, the sample composition may have introduced ascertainment biases (e.g., partial responders to SRIs may differ from responders in terms of OCD phenomenology, family characteristics, underlying neuropathology, etc.). Second, family history of tics and OCD were assessed via parent-report rather than more comprehensive family assessments used in genetics studies,[45] which may not have accurately captured incidence rates. Third, POTS II focused on characterization and treatment of OCD specifically. It is possible that findings would differ in a sample of children presenting with primary tics who have co-occurring OCD, or in those who have another primary co-occurring disorder. It is also possible that characteristics that are unique to tic-related OCD were not measured, and that these factors may have an impact on treatment outcome (e.g., neurobiological functioning[25]). Finally, youth with tics + OCD were less common at the UPenn site, which is likely attributable to that site's recruiting for a concurrent study on tics.

Recent shifts in the diagnostic classification of tic-related OCD, coupled with the push for more dimensional psychopathology research, suggest several avenues for future research. Comparing the clinical utility of different operational definitions of the tic-related OCD phenotype may be useful. It is possible that different variants of tic history, ranging from past mild transient tics to severe chronic tics, carry distinct implications for OCD clinical presentation, treatment outcome, and neurobiological and genetic underpinnings. It is also possible that other clinical features of the tic-OCD "gray area" drive clinical differences in tic-related OCD, rather than just absence or presence of tics (e.g., OCD symptoms not purely related to harm avoidance, such as sensory phenomena or incompleteness[46]). Methodology incorporating dimensional measures tapping multiple levels of analysis may also help to better elucidate the relationship between tics and OCD. Although the current results support the use of CBT for tic-related OCD, improved understanding of the tic–OCD overlap may lead to beneficial treatment adaptations. &

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