

A Measure of Functional Impairment in Youth with Tourette's Syndrome

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Objective Tourette's Syndrome (TS) during childhood is linked to varied behavioral and psychological difficulties and functional impairment. The current study was undertaken to examine both tic-related impairment and impairment from other psychological problems in 59 youth (mean age 11.4 years, 69% male) with TS. **Methods** Caretakers completed a checklist about the impact of tics and other psychological difficulties on family, school, and social functioning. In addition, a clinician administered a measure of tic severity to families. **Results** Over half of the sample reported one significant problem area due to the presence of tics, with over a third reporting two or more problem areas. Problems were heterogeneous in nature, with no report of a particular problem area in more than 25% of the children. The rate of nontic-related impairment was very high, with 70% of parents reporting at least one problem area. **Conclusions** Treating both tic and nontic-related impairments concurrently may improve functioning more so than treating the symptoms separately.

Key words assessment; children; impairment; Tourette's syndrome; validity.

Introduction

Tourette's syndrome (TS) is a lifelong neuropsychiatric disorder with an early childhood onset that is characterized by the presence of multiple motor tics and at least one vocal tic for a duration of >1 year (American Psychiatric Association, 2000). While TS was once thought to be a rare disorder, with population estimates for TS ranging from 2.9 to 5.2 cases per 10,000 (Tanner & Goldman, 1997), recent estimates have found rates from 1 to 3 per 1000 (Scahill, Tanner, & Dure, 2001) to 10 per 1000 (Kadesjo & Gillberg, 2000) in child and adolescent populations. Although having tics in childhood for a short period of time is fairly normative (Kurlan, Behr, & Medved, 1988), youth with full-blown TS may experience a wide range of behavioral and psychological difficulties. This can include highly disruptive behavior (Sukhodolsky et al., 2003), interpersonal difficulties (Carter et al., 2000), and anxiety and mood disturbances (Robertson, Banerjee,

Eapen, & Fox-Hiley, 2002). Consequently, there is a high comorbidity between TS and other psychiatric disorders, including attention-deficit/hyperactivity disorder (ADHD; 50–75% of cases; Robertson et al., 2002) and obsessive-compulsive disorder (OCD; 50% of cases; Robertson, 1995).

In addition to a high comorbidity rate, individuals with TS and their families often report impairments in daily functioning. Functional impairment is defined as the inability to perform routine and age-appropriate tasks in the domains of school, home, and social activities (Piacentini, Bergman, Keller, & McCracken, 2003). An early study of the prevalence of academic problems in children and adolescents with TS revealed that 36% (of 200 cases ages 6–18 years) had some degree of academic difficulties (Erenberg, Cruse & Rothner, 1986). Stefl (1984) found that the majority of participants had received mental health services to assist them in coping with TS and related problems, such as stigma, anxiety

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and depression.¹ In a more recent study of 138 youth (age range = 5–18 years), 46% of children with TS demonstrated school-related problems, with those with co-morbid ADHD symptoms at a nearly 4-fold increased risk for academic difficulty compared to those without ADHD symptoms (Abwender et al., 1996). In another early study it was found that 41% of adolescents and young adults with TS (age range = 15–25 years) reported some difficulty coping with their TS (Ernberg, Cruse, & Rothner, 1987). Respondents with co-morbid difficulties (tics and behavioral problems) in this study also rated the perceived impact of each aspects of TS on life functions with 45% reporting that behavior and/or learning symptoms caused the greatest interference whereas 35% felt that tics caused the greatest detrimental impact, and the remaining 10% held both aspects equally. With regards to home life, multiple studies have shown a number of family relation problems when a child has TS, including more marital difficulties, substance abuse in parents, family conflict, lowered quality of parent-child interactions, and higher levels of parenting frustration than families without a child who has TS (e.g., Cohen, Ort, Leckman, Riddle, & Hardin, 1988; Wilkinson et al., 2001). People with TS have also been found to have more difficulties in social interactions with peers (Bawden, Stokes, Camfield, & Salisbury, 1998; Storch et al., in press a) and a lower quality of life (QOL; Elstner, Selai, Trimble, & Robertson, 2001; Storch et al., in press b) than children without TS.

Despite the amount of research documenting the high rates of psychological and behavioral difficulties in children and adolescents with TS, there is no standardized measure of functional impairment specific to TS. Development of this measure is crucial in order to discriminate specific impairment associated with tics, independent of symptoms associated with TS comorbidities. The Yale Global Tic Severity Scale (Leckman et al., 1989) includes a one-item rating of tic-related impairment. While useful, this item does not capture the broad phenomenology of tic-related impairment commonly seen in youth with a tic disorder. The primary goal of this study is to provide descriptive data about impairments in academic, home, and social activities in children with tics. To accomplish this, a new measure, Child Tourette's Syndrome Impairment Scale-Parent Report about Child (CTIM-P), was developed. This scale is a 37-item

parent-rated instrument that includes school, home, and social activities that may be impaired by their child's tics. This measure was largely based on the Child Obsessive-Compulsive Disorder Impact Scale (COIS; Piacentini et al., 2003) with items borrowed from the COIS, new items added, and an additional dimension that allows parents to report impairments resulting from other behaviors (e.g., obsessive-compulsive symptoms, depressed mood, anxiety, oppositional/disruptive behavior, hyperactivity, inattentiveness, etc.). The clinical experience of the researchers helped to guide the development of the new items and the additional dimension, as many children with tics experience behavioral problems similar to those described above. This additional dimension was included to capture impairments that may result from behaviors other than tics that may exist, given the above-described high comorbidity among TS and other disorders and the possibility that co-morbid behavioral and emotional problems, rather than tics, are often the primary reason for seeking treatment (Steff, 1984). Applications of such a measure could include treatment planning, tracking progress during the course of treatment, and further research on tic-specific impairment.

To our knowledge, the CTIM-P is the first measure that quantifies the impairments that children with tics may experience, and as importantly, this measure attempts to isolate tic-related impairments from impairments due to other behaviors by having the rater differentiate between the two causes. The purpose of this study is to examine the initial psychometric properties of the CTIM-P. Our goals were as follows: (a) provide descriptive information on the frequency of items; (b) examine the internal consistency of the CTIM-P scores; and (c) examine the convergent and discriminant validity of the CTIM-P by examining the relationship of the CTIM-P with measures of tic severity, quality of life, and parent reports of their child's overall adjustment and TS related disturbance.

Method

Participants

Participants included children and adolescents diagnosed with TS or a chronic tic disorder ($n = 59$; male = 41) between January 2004 and November 2005 for outpatient visits in the University of Florida Department of Psychiatry Child and Adolescent OCD and Tic Clinic. Participants were recruited at their initial visit to this clinic, where they were seeking consultation regarding pharmacological and/or behavioral treatment options. Although the age of

¹Although the mean age of the sample was not provided, the following data on age ranges was included: 26.2% were under 10 years of age; 30.2% were 11–14 years of age; 17.2% were 15–18 years of age; and 26.5% were 19 years of age or older.

tic onset and illness duration were not systematically collected, by virtue of our inclusion criteria of TS or a chronic tic disorder, youth had tics for at least one year prior to presentation (without a tic-free period of >3 months). The mean age of children was 11.4 years ($SD = 2.6$ years; range = 8–17 years), with an ethnic distribution as follows: Caucasian (97%) and Hispanic (3%). The income range was positively skewed with one family reported earning <\$19,999, six reported earning between \$20,000 and \$39,999, ten reported earning between \$40,000 and \$59,999, 13 reported earning between \$60,000 and \$79,999, and 25 reported earning over \$80,000. Four families did not report their income range. Forty-two mothers, 16 fathers, and one custodial grandparent of four participants with tics completed parent forms.

Tic disorder and co-morbid diagnoses were made by a board-certified child psychiatrist with 10 years of experience (TKM) in accordance with the Diagnostic and Statistical Manual of Mental Disorder-Fourth Edition-Text

Revision (DSM-IV-TR; Psychiatric Association, 2000) by using all available clinical information (Leckman, Sholomskas, Thompson, Belanger, & Weissman, 1982), which included information from the Yale Global Tic Severity Scale (YGTSS; Leckman et al., 1989), clinical interview, and responses to other measures that were not included in the study [i.e., Tourette's Disorder Scale (TODS); Shytle et al., 2003]. In addition, both tic and co-morbid diagnoses were confirmed by one of two licensed clinical psychologists with extensive clinical experience (EAS or GRG) based on a discussion with the psychiatrist and review of all available records. In the rare instance that disagreements regarding diagnosis were unable to be resolved through discussion, the primary psychiatrist (TKM) made the final decision. The most prevalent co-morbid diagnoses for the current sample were ADHD ($n = 28$) and OCD ($n = 25$), with other co-morbid diagnoses in the population including Generalized Anxiety Disorder ($n = 7$), Major Depression ($n = 6$), Oppositional Defiant Disorder ($n = 6$), Asperger's Disorder ($n = 3$), Social Phobia ($n = 2$), and Panic Disorder ($n = 1$).

Measures

Child Tourette's Syndrome Impairment Scale – Parent Report about Child.²

The CTIM-P is a 37-item parent-rated instrument that includes school, home, and social activities that may be

impaired by their child's tics or a co-morbid problem (e.g., obsessive-compulsive symptoms, depressed mood, anxiety, oppositional/disruptive behavior, hyperactivity, inattentiveness). Parents are instructed to "Please rate how much your child's Tourette's syndrome (vocal and motor tics) has caused difficulties for him or her in the following areas over the past month." The month time frame was chosen to be consistent with the COIS (Piacentini et al., 2003) and allow an adequate time frame for the child to engage in the range of activities assessed by the CTIM-P. A four-point rating system (Not at all, Just a little, Pretty much, and Very much) is used by the parents to rate impairment for activities such as "Getting to school on time" and "Doing household chores" first for tic-related impairment, and then for impairment due to a co-morbid problem, which they identify. Items that are subjectively considered by the parent to not be relevant for their child were rated as "not applicable" (e.g., having a boyfriend/girlfriend for a 9-year-old). A Tic Impairment score is derived by totaling all items in the Tic dimension [the mean item-rating of the particular subscale (i.e., School Activities) is substituted for "not applicable" items in deriving the total score]; a Nontic Impairment score is derived by totaling all items in the Nontic dimension.

Yale Global Tic Severity Scale

The Yale Global Tic Severity Scale (YGTSS; Leckman et al., 1989) is a semi-structured clinician-rated instrument of motor and phonic tic severity over the past week. The clinician initially queries the presence of various tics based on child and parent reports and his/her behavioral observations. The clinician then rates the number, frequency, intensity, complexity, and interference of motor and phonic tics separately. A separate, one-item impairment rating is also included that captures distress and impairment in interpersonal, academic, and occupational realms due to all endorsed tics. The YGTSS has good interrater agreement [intraclass correlation coefficients (ICC) for index scores ranging from .62 to .85; Leckman et al., 1989] and 7-week stability (ICCs for index scores ranging from .77 to .90; Storch et al., 2005). YGTSS scores were moderately to strongly related to different clinician-rated tic severity and impairment measures (Storch et al., 2005). Discriminant validity was demonstrated by weak to moderate relations with clinician-ratings of ADHD impairment and OCD, child-rated anxiety and depression, and parent-rated aggression and ADHD (Storch et al., 2005).

²Please contact the first author to obtain a copy of the CTIM-P.

Child Behavior Checklist

The Child Behavior Checklist (CBCL; Achenbach, 1991) is a commonly used 118-item questionnaire that assesses parental reports of their child's emotional and behavioral functioning. Parents rate on a 0–1–2 scale (0 = not true; 1 = somewhat or sometimes true; and 2 = very or often true) the degree to which a behavior is true for their child. The CBCL has demonstrated psychometric properties across a variety of clinical and nonclinical populations (Achenbach, 1991). For the purposes of this study, the Internalizing and Externalizing Scale and Social Problems Subscale scores were used.

Pediatric Quality of Life Inventory

The Pediatric Quality of Life Inventory version 4.0 (PedsQL; Varni, Seid, & Rode, 1999) is a 23-item measure of children's QoL with parallel child (PedsQL) and parent proxy reports (PedsQL Parent Proxy). Items are rated on a 5-point scale with higher scores corresponding to better QoL. The PedsQL is broken down into four scales: (a) physical functioning (eight items); (b) emotional functioning (five items); (c) social functioning (five items); and (d) school functioning (five items). The individual scales are combined to yield physical (equivalent to the physical functioning domain), psychosocial (sum of emotional, social, and school functioning domains), and total health scales (all 4 domains). Extensive psychometric data exist for the PedsQL and PedsQL Parent Proxy across multiple pediatric illnesses (e.g., Bastiaansen et al., 2004; Varni et al., 2003; Varni, Seid, & Kurtin, 2001).

Procedures

Prior to study onset, the University of Florida institutional review board granted relevant ethical permissions. Written parental consent and child assent was obtained for each participating youth before administering measures (consent rate = 91%; 59/65). Participation was voluntary, and families were compensated \$5.00 for their participation with funds being given to the consenting parent for distribution. Measurement administration was counterbalanced with ~50% of families being administered the YGTSS before completing child- and parent-report measures. A trained research assistant provided instructions for each measure and was available for assistance. Masters or doctoral-level clinical psychology trainees, trained in administration by the first author, administered the YGTSS to both the child and parent jointly in a private clinical office. YGTSS training consisted of an instructional meeting about the YGTSS,

four practice interviews, and four directly observed interviews.

Analytic Plan

All analyses were conducted using SPSS 14.0. The first analyses conducted were frequency distributions on the areas of impairments that were and were not related specifically to tics, as well as item means and standard deviations for items. Items rated as not applicable were not included in the frequency count. However, the mean item-rating of the particular subscale (i.e., School Activities subscale) was substituted for the missing value in deriving the total score. Next, Pearson's correlational analyses were computed to examine the relationship between age and number of tic-related problems. Given the exploratory nature of this study, alpha was set at .05 for these and later correlational analyses. In order to examine the reliability of the CTIM-P, a Cronbach's alpha coefficient of internal consistency was calculated for both tic-related and nontic-related impairment items. Finally, the convergent and discriminant validity of the measure was examined. This was accomplished by constructing a Pearson's correlational matrix and examining the relationship between the C-TIMP scores for tic and nontic impairment and the other measures described above.

Results

Impairment Related to Tics

Table I presents the prevalence rates for TS-related problems according to parental report, as well as mean item ratings. The areas where parents reported the highest percentage of impairment (defined as a rating of pretty much or very much) due to tics were primarily school related, such as writing during class (24.6%), doing homework (21.9%), concentrating on work (21.8%), and being prepared for class (18.5%), or social activity related, such as being teased by peers (17.5%) and making new friends (15.8%). There was a wide range of endorsement on particular items, but the majority of the sample reported significant problems in one or more areas (52.1%), with 37.5% of the sample reporting significant problems in two or more areas. Across broad categories of impairment, 35.6% of children were reported as having at least one significant problem area in school, 23.7% were reported to have at least one significant problem area at home, and 25.4% were reported to have at least one problem area in social activities. Of those children with significant problems, 10.2% reported at least one

Table I. Parent Reports (%) of TS-Related Problems

	Not at all	Just a Little	Pretty Much	Very Much	Mean (SD)
School Activities					
Getting to school on time	86.4	10.2	3.4	0.0	0.17 (.46)
Missing school	84.5	10.3	1.7	3.4	0.24 (.65)
Giving oral reports or reading out loud	71.2	15.3	6.8	6.8	0.49 (.90)
Being prepared for class (e.g., has books, homework)	57.9	24.6	7.0	10.5	0.68 (.99)
Writing in class	59.6	15.8	12.3	12.3	0.75 (1.08)
Taking tests or exams	60.7	26.8	8.9	3.6	0.53 (.80)
Doing homework	56.4	12.8	16.4	5.5	0.66 (.92)
Participating in gym	81.8	12.7	3.6	1.8	0.24 (.60)
Doing fun things during recess or free time	87.7	8.8	3.5	0.0	0.15 (.45)
Concentrating on his/her work	56.4	21.8	14.5	7.3	0.68 (.95)
Eating meals with other kids	87.3	9.1	3.6	0.0	0.15 (.45)
Home Activities					
Getting dressed in the morning	89.5	7.0	3.5	0.0	0.14 (.43)
Bathing or grooming	89.1	3.6	5.5	1.8	0.19 (.60)
Doing household chores	80.4	10.7	5.4	3.8	0.31 (.73)
Eating meals at home	85.7	10.7	3.6	0.0	0.17 (.46)
Getting ready for bed at night	80.4	16.1	3.6	0.0	0.22 (.49)
Sleeping at night	82.1	7.1	5.4	5.4	0.32 (0.80)
Getting along with siblings	66.1	21.4	5.4	7.1	0.51 (.88)
Getting along with parents	65.5	27.3	3.6	3.6	0.42 (.72)
Visiting relatives	86.0	8.8	3.5	1.8	0.20 (.58)
Going on family vacation	82.5	10.5	5.3	1.8	0.25 (.63)
Going to religious services	75.0	19.6	3.6	1.8	0.31 (.62)
Social Activities					
Making new friends	63.2	21.1	12.3	3.5	0.54 (.84)
Keeping friends	71.4	17.9	7.1	3.6	0.41 (.77)
Spending time with friends	73.7	17.5	5.3	3.5	0.37 (.74)
Having conversations with other kids	69.6	19.6	5.4	5.4	0.44 (.82)
Being teased by peers	57.9	24.6	10.5	7.0	0.64 (.92)
Leaving the house	94.7	3.5	0.0	1.8	0.01 (.43)
Being with a group of strangers	71.9	17.5	10.5	0.0	0.37 (.67)
Going to a friend's house during the day	84.2	10.5	3.5	1.8	0.22 (.59)
Having a friend at the house during the day	85.7	8.9	5.4	0.0	0.19 (.51)
Spending the night at a friend's house	84.2	8.8	5.3	1.8	0.24 (.63)
Having a friend spend the night	89.5	5.3	1.8	3.5	0.19 (.63)
Having a boyfriend/girlfriend	85.7	10.7	0.0	3.6	0.20 (.61)
Going shopping	80.7	14.0	1.8	3.5	0.27 (.67)
Eating in public places	86.0	8.8	1.8	3.5	0.22 (.65)
Going to the movies	86.0	7.0	1.8	5.3	0.25 (.73)

Note. SD = Standard deviation.

problem area in each domain (school, home, and social activities).

Nontic Impairment

Table II presents the prevalence rates and item means for nontic-related problems according to parental report. Note that the majority of the sample (79.7%) had at least

one co-morbid diagnosis, with the primary co-morbid diagnosis being OCD (55.9%) and ADHD (45.8%). The areas where parents reported the highest percentage of impairment (defined as a rating of "pretty much" or "very much") due to co-occurring problems were primarily school related, including concentrating on work (38.9%), doing homework (37.1%), being prepared for class (27.0%), taking tests or exams (25.9%), and

Table II. Parent Reports (%) of NonTS-Related Problems

	Not at all	Just a Little	Pretty Much	Very Much	Mean ± SD
School Activities					
Getting to school on time	69.4	18.4	8.2	4.1	0.39 (.77)
Missing school	75.0	11.5	9.6	3.8	0.37 (.79)
Giving oral reports or reading out loud	65.4	21.2	5.8	7.7	0.49 (.88)
Being prepared for class (e.g., has books, homework)	48.1	25.0	21.2	5.8	0.75 (.94)
Writing in class	62.7	15.7	11.8	9.8	0.59 (.98)
Taking tests or exams	61.1	13.0	22.2	3.7	0.63 (.93)
Doing homework	42.6	20.4	24.1	13.0	0.98 (1.09)
Participating in gym	80.4	13.7	5.9	0.0	0.22 (0.53)
Doing fun things during recess or free time	83.0	11.3	5.7	0.0	0.20 (.52)
Concentrating on his/her work	38.9	22.2	25.9	13.0	1.03 (1.08)
Eating meals with other kids	82.7	13.5	1.9	1.9	0.20 (.55)
Home Activities					
Getting dressed in the morning	71.2	25.0	3.8	0.0	0.29 (0.53)
Bathing or grooming	67.3	23.1	9.6	0.0	0.37 (0.64)
Doing household chores	56.9	25.5	11.8	5.9	0.58 (.88)
Eating meals at home	80.8	17.3	1.9	0.0	0.19 (.43)
Getting ready for bed at night	63.5	23.1	13.5	0.0	0.44 (.70)
Sleeping at night	65.4	17.3	13.5	3.8	0.49 (.84)
Getting along with siblings	59.2	26.5	8.2	6.1	0.51 (.84)
Getting along with parents	49.0	33.3	11.8	5.9	0.64 (.87)
Visiting relatives	86.0	8.0	4.0	2.0	0.19 (.57)
Going on family vacation	80.4	11.8	3.9	3.9	0.27 (.69)
Going to religious services	71.2	21.2	3.8	3.8	0.36 (.71)
Social Activities					
Making new friends	65.4	13.5	19.2	1.9	0.51 (.84)
Keeping friends	65.4	21.2	9.6	3.8	0.46 (.79)
Spending time with friends	67.3	17.3	13.5	1.9	0.44 (.77)
Having conversations with other kids	61.5	25.0	11.5	1.9	0.47 (.75)
Being teased by peers	66.7	23.5	3.9	5.9	0.42 (.79)
Leaving the house	84.3	3.9	9.8	2.0	0.25 (.68)
Being with a group of strangers	67.3	17.3	15.3	0.0	0.42 (.72)
Going to a friend's house during the day	90.4	5.8	3.8	0.0	0.12 (.42)
Having a friend at the house during the day	84.6	11.5	3.8	0.0	0.17 (.46)
Spending the night at a friend's house	84.0	10.0	4.0	2.0	0.20 (.58)
Having a friend spend the night	88.2	7.8	3.9	0.0	0.14 (.43)
Having a boyfriend/girlfriend	85.7	6.1	8.2	0.0	0.19 (.54)
Going shopping	76.5	15.7	3.9	3.9	0.31 (.70)
Eating in public places	88.2	3.9	3.9	3.9	0.20 (.66)
Going to the movies	90.2	9.8	0.0	0.0	0.01 (.28)

Note. SD = Standard deviation

writing in class (21.6%). Other areas of high impairment included making new friends (21.3%), doing household chores (17.6%), sleeping at night (17.3%), and being with a group of strangers (15.3%).

While there was a wide range of endorsement on particular items, the majority of the parents reported problems in one or more areas (69.5%), with 38.9% reporting two or more significant problem areas.

Across broad categories of impairment, 49.2% of children were reported as having at least one significant problem area in school, 39.0% were reported to have at least one significant problem area at home, and 42.4% were reported to have at least one problem area in social activities. Across all the children in the study, 22.0% reported at least one problem area in each domain (school, home, and social activities).

Table III. Pearson Product Moment Correlations for Various Measures of Psychological Functioning

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) CTIM-P-Tic	1.00	.156	.370*	.433**	.513**	.513**	.298*	.081	.436**	-.422**	-.321*
(2) CTIM-P nonTic		1.00	-.142	-.106	-.007	-.072	.334*	.314*	.354*	-.608**	-.287*
(3) YGTSS Motor			1.00	.565**	.707**	.824**	-.040	-.123	-.030	.048	-.190
(4) YGTSS Phonic				1.00	.710**	.842**	.174	.098	.195	-.184	-.331*
(5) YGTSS Impairment					1.00	.956**	.214	.170	.338*	-.247	-.394*
(6) YGTSS Total						1.00	.162	.063	.240	-.181	-.369*
(7) CBCL Externalizing							1.00	.679**	.581**	-.636**	-.309*
(8) CBCL Internalizing								1.00	.514**	-.669**	-.491**
(9) CBCL Social Problems									1.00	-.651**	-.590**
(10) PEDS-QL Parent										1.00	.647**
(11) PEDS-QL Child											1.00
Mean	12.41	14.58	13.39	7.91	18.21	39.52	11.56	12.81	3.83	71.78	71.93
Standard Deviation	15.91	14.89	6.40	7.33	13.90	24.73	8.86	9.89	3.33	16.28	16.18

Note: CTIM-P=Child Tourette's Syndrome Impairment Scale – Parent Report about Child, YGTSS=Yale Global Tic Severity Scale, CBCL=Child Behavior Checklist, PEDS-QL=Pediatric Quality of Life Scale

* $p < .05$, ** $p < .001$

Associations between Tic-Related Impairment and Age

Age was significantly correlated with a number of tic-related problems. In the school-related problems, significant relationships were found for giving oral reports ($r = .342$, $p = .008$), participating in gym ($r = .485$, $p < .001$), and doing fun things at recess ($r = .373$, $p = .004$). Home activities with significant relationships were getting dressed in the morning ($r = .298$, $p = .024$), doing chores ($r = .292$, $p = .029$), getting ready for bed ($r = .335$, $p = .012$), sleeping at night ($r = .268$, $p = .046$), getting along with parents ($r = .410$, $p = .002$), visiting relatives ($r = .353$, $p = .007$), going on vacations ($r = .269$, $p = .043$), and attending religious services ($r = .291$, $p = .03$). Social activities where problems were correlated with age included having a friend come over during the day ($r = .292$, $p = .029$), spending the night at a friend's house ($r = .269$, $p = .043$), having a friend spend the night ($r = .342$, $p = .008$), and having a boyfriend or girlfriend ($r = .376$, $p = .004$).

Reliability and Validity of the CTIM-P

Internal consistency of the CTIM-P items dealing with tic-related impairment was found to be excellent, with a Cronbach's alpha coefficient of .938. Inter-item correlations for the 37 items ranged from absolute values of .03 to .95, while item-total correlations ranged from .174 to .730. Analyses showed that the deletion of any item did not significantly improve the statistical value of the alpha coefficient.

Analyses on the nontic impairment CTIM-P items were then conducted. The internal consistency of these

items was excellent, with a Cronbach's alpha coefficient of .923. The inter-item correlations for the items ranged from absolute values of .004 to .574, with item-total correlations ranging from .254 to .764. As with the tic-related impairment items, analyses showed that deletion of any individual item would not significantly raise the alpha coefficient.

To measure the convergent validity of the CTIM-P, the items concerning tic-related impairment were summed to provide a CTIM-P-Tic score ($M = 12.41$, $SD = 15.91$, range 0–80). Using Pearson product moment correlation coefficients, associations between the CTIM-P-Tic score and other study measures were examined (Table III). All correlations were in the expected direction and statistically significant, with the exception of a nonsignificant relationship between the CTIM-P-Tic score and the CBCL Internalizing Scale. For example, the CTIM-P Tic score was moderately related to the YGTSS Impairment rating and total score. Using Fisher r to z transformations, correlations between the CTIM-P-Tic score and the YGTSS scores were of a greater magnitude than the correlations between the CTIM-P-nonTic score and the parallel YGTSS score ($p < .05$).

To examine the discriminant validity of the CTIM-P, the items concerning nontic-related impairment were summed to provide a total score ($M = 14.58$, $SD = 14.89$, range 0–64). This score was also correlated with the measures used above (Table III). As can be seen, while there were significant correlations with the more general measures of distress (e.g., CBCL scales, Peds-QL total scores), there were not significant correlations between the nontic impairment total score and YGTSS scores indicating that parents were able to discriminate between

the impairment caused by their child's tics and the impairment caused by other, co-morbid problems.

Discussion

The current study was designed to develop a measure to describe the impact of tics on the daily functioning of children with TS or a chronic tic disorder. The results of the study indicate that a large percentage of children with tics experience tic-related impairment in the realms of school, home, or social functioning. While the rate of tic-related impairment is not as high as impairment seen in children with OCD (Piacentini et al., 2003), over half of the current sample reported at least one significant problem area, and over 37% reporting two or more significant problem areas. It may be that those subjects who did not endorse tic-related impairment on the CTIM-P were given a TS diagnosis by virtue of tic-related impairments not assessed on the CTIM-P (e.g., physical issues such as sore muscles) and/or impairment due to co-morbid problems. Consistent with previous findings using the TODS (Shytle et al., 2002, 2003), we found that close to 70% of the problems experienced were due to nontic-related impairment, most often as a result of either ADHD or OCD symptoms. Taken together, the current study suggests that children who present with tics may be impaired in a wide range of life tasks as a function of tics and/or co-morbid behavior problems. As both sets of difficulties have been shown to cause impairment, treating them concurrently may improve functioning more so than treating the symptoms separately. However, it remains a separate empirical question whether this would be preferable to sequential treatment of tics and other co-occurring problems.

Several significant differences were seen between ages. However, when interpreting the analyses involving age, it is important to note a number of potential confounding factors including the wide age range, lack of systematic information on the age at TS diagnosis and illness duration, and potential differences in the base rates of participation in activities by older versus younger children. With these issues in mind, older children reported more difficulties in the school areas of presenting reports orally, being involved in gym, and having fun during recess. At home, problem areas appeared to be related to independent functioning (e.g., doing chores, getting ready for bed at night) and family activities (e.g. going on vacations, attending religious services). Socially, more problems were reported for older children

in having other children come over during the day, spending the night with a friend, and having romantic relationships. It is important to note that older age is typically associated with decreased tic-related impairment (e.g., Coffey et al., 2004), but those results and the results of the current study examined slightly different age ranges. While the current results may be partially due to using a clinical sample, this increased incidence of problems for older children is worthy of further study.

The lack of homogeneity in which areas were reported to be problematic may be indicative of the highly idiographic disruptions in functioning due to tics. As noted above, while the majority of the sample indicated at least one problem area, the most commonly noted tic-related impairment (writing in class) was present in <25% of children. This points to the need for a careful assessment of tic-related impairment on an individual basis, rather than assuming that all children diagnosed with tics have similar problems. The strong relationships found between the level of impairment endorsed by the parents and other measures of tic-related impairment supports the construct validity of the CTIM-P, and the lack of relationships between the CTIM-P and more global measures of distress supports the discriminant validity of the measure. Combined with the excellent internal consistency of the measure, the psychometric properties of the CTIM-P appear to be quite strong.

There are several weaknesses of the current study. First, there is a lack of a child-self report version of the measure and items were grouped in an *a priori* fashion into the areas of school, family, and social subscales. Second, there was not a control, nontic group to examine the specificity of the measure and the nonclinical base rates for the behaviors examined. Finally, duration of illness was not systemically examined; it is conceivable that longer illness durations may be associated with greater impairment. In terms of strengths, the current study included a carefully defined sample, inclusion of multiple tic-related impairment measures covering parent, child, and clinician report, and a relatively large sample.

Based on the rates of problem areas found in current study, interventions for children experiencing tic-related impairment are sorely needed. Further research should focus on the exploration of the functional limitations placed on children due to tic-related impairment and the consequences of those limitations on their psychosocial development. The impact of the child's tics on the entire family's functioning is also an area in need of exploration. Although the initial psychometric properties of the

CTIM-P are promising, future research on test–retest reliability and change scores in response to treatment is needed. Finally, the development and assessment of therapeutic interventions designed to address the specific functional limitations seen in children with tics should be undertaken. Although pharmacotherapy is a leading treatment for tics, psychosocial treatments, such as Habit Reversal Therapy (Deckersbach, Rauch, Buhlmann, & Wilhelm, in press; Woods, Wetterneck, & Flessner, in press), that teach individuals skills in managing tics may hold strong promise in this regard.

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