

## Peer Victimization in Youth with Tourette Syndrome and Other Chronic Tic Disorders

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**Abstract** Chronic tic disorders including Tourette syndrome have negative impact across multiple functional domains. We explored associations between peer victimization status and tic subtypes, premonitory urges, internalizing symptoms, explosive outbursts, and quality of life among youth with chronic tic disorders, as part of the internet-based omnibus Tourette Syndrome Impact Survey. A mixed methods design combined child self-report and parental proxy-report (i.e., parent reporting on the child) demographic and quantitative data for affected youth ages 10–17 years addressing gender, mean age, ethnicity and other socioeconomic features, and presence of tic disorders and co-occurring psychiatric disorders. Peer “Victim” versus “Non-victim” status was determined using a subset of four questions about being bullied. “Victim” status was identified for those youth who endorsed the frequency of the occurrence of being bullied in one or more of the four questions as “most of the time” or “all of the time”. Data from 211 eligible youth respondents and their parents/guardians showed 26% reporting peer victimization. Victim status was associated with greater tic frequency, complexity and severity; explosive outbursts; internalizing symptoms; and lower quality of life. Peer victimization among youth

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with chronic tic disorders is common and appears associated with tic morbidity, anxiety, depression, explosive outbursts, and poorer psychosocial functioning. Anticipatory guidance, specific bullying screening and prevention, and further studies are indicated in this population.

**Keywords** Tourette syndrome · Chronic tic disorder · Bullying · Peer victimization · Quality of life

### Abbreviations

ADHD	Attention deficit hyperactivity disorder
CTD	Chronic tic disorders
MD	Mood disorder
OCD	Obsessive compulsive disorder
PedsQL	Pediatric quality of life inventory
PTQ	Parent tic questionnaire
PUTS	Premonitory urge for tics scale
RAQ	Rage attacks questionnaire
SCAS	Spence children's anxiety scale: child and parent
SMFQ	Short mood and feelings questionnaire
TS	Tourette syndrome

### Introduction

Children with neurodevelopmental and behavioral disorders are at increased risk for peer victimization [1, 2] in comparison with their typically developing peers. Tourette syndrome (TS) and other Chronic Tic Disorders (CTD) are representative of such disorders. These inherited neuropsychiatric conditions of childhood onset are characterized by chronic, repetitive, semi-voluntary irregular movements and/or vocalizations called “tics.” Unpleasant premonitory sensations, or “urges”, often precede and are temporarily relieved by performing a tic. Additional psychiatric conditions usually co-occur in people who have TS/CTD. These comorbid conditions, such as Attention deficit hyperactivity disorder (ADHD), Obsessive–Compulsive Disorder (OCD), explosive outbursts, and mood and non-OCD anxiety disorders, are not part of the formal TS/CTD diagnoses, and may also increase risk for peer victimization. Tourette syndrome is common, affecting from 1 to 10 per 1,000 school-aged children [3]. Other CTDs by diagnostic convention feature *only* motor *or* vocal tics but are otherwise indistinguishable from and are perhaps twice as prevalent as TS.

Identifying TS/CTD features (such as tic severity, urges, or psychiatric comorbidity) that are most strongly associated with victimization by peers is of great clinical and public health significance and may lead to improved treatments and functional outcomes for affected children. However, to date, possible associations between these features and peer victimization have not been adequately explored.

The presence of chronic (i.e., enduring a year or more) tics characterizes all people diagnosed with TS/CTD, yet the actual experiences surrounding tic expressions and tic severity vary enormously. Tic severity can be defined by several dimensions, including: tic frequency, intensity, complexity, number of tic types and the disruption or distraction caused

by premonitory urges or by actual tic expressions, and each of these dimensions can be more or less severe across individuals. More severe tics are often associated with stronger premonitory urges [4] and may elicit unwanted attention by others. The specific impact of tic severity on the well-being and quality of life among children with TS/CTD, independent of contributions secondary to comorbid psychiatric conditions, is controversial [5, 6]. Less controversial, however, is that children with TS/CTD experience lower quality of life when compared to children without these disorders [7]. Also, healthy/unaffected children often view their peers with tics less positively [8] and as more withdrawn and less popular [9]. Social withdrawal among children is associated with peer rejection [10]. These impacts of peer victimization may be associated with tic exacerbation and/or impaired adaptive psychosocial functioning, and may contribute to peer-oriented difficulties and ostracism [11]. A recent study of children with tics demonstrated more peer victimization than in comparison groups of children with type 1 diabetes and healthy controls. Additionally, peer victimization correlated with tic severity, loneliness and anxiety, suggesting an association of peer victimization with tic severity and internalizing symptoms [12]. Furthermore, caretakers of children with TS/CTD identify these children as having impaired social functioning, both in relation to tics and to co-occurring conditions [13], and describe these children as experiencing a diversity of discriminations due to their tics [14].

Common comorbid conditions, together or independently of tics, also often impair social, academic and other functional domains [15, 16]. Specific psychiatric comorbidities including, but not limited to, ADHD have been associated with a particularly disruptive form of impulsive aggression (sometimes referred to in the literature interchangeably as “explosive outbursts” or “rage attacks”) in children with TS/CTD [17]. Explosive outbursts appear unrelated to tic type or severity [17, 18], although some studies have implicated increased tic severity, complexity, and obsessionality with aggressive symptoms in TS/CTD [19].

Both biological and environmental variables are associated with tic exacerbation [20] and may include psychosocial effects (such as those resulting from stress, fatigue and anxiety), illness, some medications and other substances [21], and situational features, including observers’ reactions to tics [22]. According to the behavioral model of TS/CTD, these environmental variables may serve as preliminary events that then link to a heightened perception of premonitory urges [23], resulting in tic exacerbation. For example, peer victimization may pose an environmental psychosocial stress that may be linked as an increase in premonitory urges.

Since chronic behavioral, emotional, or developmental challenges are associated with bullying others, and with being both a bully and a victim (i.e., “bully-victim”) [24], children with TS/CTD and psychiatric co-morbidities are at increased risk. Furthermore, among nonclinical populations, bullying is associated with depression, loneliness, social anxiety, somatic complaints, and poor school functioning [25–27].

Peer victimization may contribute to tic symptoms and overall illness burden. Since very little data are available concerning peer victimization among youth with TS/CTD, and even less is known about associations between peer victimization and tic phenomenology or psychosocial functioning, we examined self-reported peer victimization in youth with TS/CTD, comparing “Victims” with “Non-victims” along indices of tic type and symptom severity, internalizing symptoms, explosive outbursts and quality of life. We hypothesized that children who experience peer victimization (“Victims”) would have greater tic symptoms (increased total tic severity and premonitory urge intensity), internalizing symptoms (i.e., depression, anxiety), explosive outbursts, and poorer quality of life when compared to “Non-victims”.

## Methods

### Participants

This study was part of the omnibus Tourette Syndrome Impact Survey [14] and approved by the University of Wisconsin-Milwaukee Institutional Review Board. The Tourette Syndrome Association (TSA; <http://www.tsa-usa.org>), a large non-profit membership organization supporting TS/CTD research and advocacy, aided in participant recruitment by placing a link to the survey on its national website and directing members to the link via emails and a newsletter announcement. Since neurological distinction between TS and CTD remains scientifically ambiguous, TS/CTD cases were combined in this study, in keeping with common clinical and research practice.

Participants were included if parents reported that their child (1) had been formally diagnosed with TS/CTD ( $N = 740$ ); and, youth between the ages of 10–17 (2) provided assent to participate ( $N = 421$  of those meeting inclusion criterion 1); (3) answered at least one survey question ( $N = 232$  of those meeting inclusion criteria 1 and 2); and (4) answered at least one bullying question (i.e., peer victimization;  $N = 211$  of those meeting criteria 1, 2, and 3). Participants were 211 parent–child dyads.

### Procedure

The survey was posted online from July 2008 to January 2009. Page one was parent informed consent addressing the study's purpose. Parents were instructed to complete a parent portion of the survey and to ask affected youth between 10 and 17 years to complete the youth portion. Parents consented by checking "Yes, I agree to participate."

Consenting parents were asked, "Is your child between the ages of 10–17?" Parents who checked "no" completed the parent portion only (note: their data were not included in this study). Parents who checked "yes" were instructed to ask their child to read an assent document. Youth assented by checking "Yes, I agree to be in the study." Parents next completed the parent portion of the survey and then were instructed to allow the child to complete the youth portion alone unless questions arose. Parent and youth portions each required approximately 45 minutes to complete.

Survey responses were stored on a password-protected account and transferred into a statistical program. Computer IP addresses were not collected. No repeat responders were identified [14].

### Materials

#### *Demographic Questions*

Parents declared child's age, gender, education level, and ethnicity; whether their child ever received treatment for tics or had been formally diagnosed with a co-occurring psychiatric disorder; annual household income and parent education level.

#### *Peer Victimization/Bullying Questions*

Although no standardized instrument for bullying research exists, the questions about peer victimization/bullying in this study were based on questions customarily used in the field

**Table 1** Questions about being bullied and bullying others*Questions about being bullied*

Do other kids

Pick on you, make fun of you, call you mean names, or copy things you do in a mean way?

Pick fights with you, push you around, or try to hurt you?

Tell lies, gossip, or spread rumors about you?

Leave you out of things (like games, recess activities, sports) or not invite you to do things with them?

*Questions about bullying others*

Do you

Pick fights with other kids, push other kids around, or try to hurt other kids?

Tell lies, gossip, or spread rumors about other kids?

Leave other kids out of things (like games, recess activities, sports) or purposefully not invite other kids to do things with you?

Torture animals or pets or treat them in a mean way?

Being bullied and bullying questions are based on those customarily used in this field of research

of bullying research. Youth were asked 8 questions about being bullied or bullying others, with response options “never,” “sometimes,” “most of the time,” and “all of the time.” Unless responding “never,” a follow-up yes/no question, “Do other kids do these things to you because of your tics?” was asked. Questions about being bullied and about bullying others are presented in Table 1. Internal consistency was good for peer victimization ( $\alpha = 0.82$ ) and acceptable for bullying questions ( $\alpha = 0.65$ ).

*Parent Tic Questionnaire (PTQ) [28]*

The PTQ is a parent-report measure assessing tics during the previous week, identifying whether each of 14 motor and vocal tics occurred, and indicating the intensity and frequency of each by Likert scales, with sums ranging from 0 (tic absent) to 8 (maximum intensity and frequency). The sum of all 28 individual tic scores yields a total tic severity score (0–224); motor and vocal tic severity scores can be calculated separately (0–112). The measure shows internal consistency ( $\alpha = 0.90$ ), temporal stability (ICC = 0.84), convergent validity ( $r = 0.72$ ), and discriminant validity ( $r = 0.62$ ). In the current sample, internal consistency was good ( $\alpha = 0.80$ ).

*Premonitory Urge for Tics Scale (PUTS) [4]*

The PUTS is a self-report measure rating premonitory urge descriptions on a 5-point ordinal scale anchored by “not at all true” and “very true.” The PUTS shows internal consistency ( $\alpha = 0.81$ ) and temporal stability at 1 ( $r = 0.79$ ) and 2 ( $r = 0.86$ ) weeks. Internal consistency was good in the current sample ( $\alpha = 0.85$ ).

*Spence Child Anxiety Scale (SCAS) [29]*

The SCAS is a youth self-report measure of anxiety with 38 specific anxiety symptoms and 6 positive filler items. The SCAS yields a total score and six empirically derived subscales: generalized anxiety, separation anxiety, social phobia, OCD, panic-agoraphobia, and fears of physical injury. A 4-point scale ranges from 0 (“never”) to 3 (“always”). The sum for the 38 anxiety items yields a total possible score of 114. Mean total scores in normative samples

range from 14.3 (SD = 10.5) [30] to 28.6 (SD = 16.5). The scale has good internal consistency ( $\alpha = 0.92$ ), temporal stability ( $r = 0.6$ ), convergent validity ( $r = 0.71$ ), and divergent validity ( $r = 0.08$ ). In the current sample, internal consistency was very good ( $\alpha = 0.90$ ).

#### *Spence Child Anxiety Scale for Parents (SCAS:P) [31]*

The SCAS:P is identical to the SCAS, but omits positive filler items, and parents rate each item for their child. Normative mean total scores are 14.2 (SD = 9.7) for controls and 31.8 (SD = 14.1) for children with anxiety disorders. The SCAS:P has good internal consistency ( $\alpha = 0.89$ ) and convergent validity ( $r = 0.59$ ). Parent–child agreement ranges from 0.23 to 0.60. Internal consistency for the current sample was very good ( $\alpha = 0.93$ ).

#### *Short Mood and Feelings Questionnaire (SMFQ) [32]*

The SMFQ is a self-report measure assessing affective and cognitive symptoms of depression on a 3-point scale (0 = not true, 1 = sometimes, 2 = true), summed to yield a total score. The SMFQ has good internal consistency ( $\alpha = 0.90$ ); in the current sample  $\alpha = 0.89$ .

#### *Pediatric Quality of Life Inventory: Short Form Generic Core Scales, Version 4.0 (PedsQL:SF15) [33]*

The PedsQL:SF15 is a 15-item scale for health-related quality of life, and includes parallel youth self-report and parent-report formats, with child (ages 8–12) and adolescent (13–18) versions. Items differ across versions only in grammatical person (first vs. third) and term (“child” versus “teen”). Respondents rate item occurrence during the past month (0 = never to 4 = almost always). Items are reverse-scored and linearly transformed to a 0–100 scale; higher scores indicate better quality of life. The average of all items yields a total scale score. Mean total scores for healthy samples range from 83.0 (SD = 14.9) [12] to 86.1 (SD = 11.2). Storch et al. also reported mean scores of 72.2 (SD = 12.7) in a psychiatric sample and 71.9 (SD = 16.2) in a TS/CTD sample. The measure has good internal consistency ( $\alpha = 0.85$  child, 0.89 parent) and construct validity.

#### *Rage Attacks Questionnaire (RAQ) [17]*

Information about explosive outbursts was elicited from parental survey responses using this screen and questionnaire that probes for the diagnostic criteria for intermittent explosive disorder according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth edition [34–36]. Question 1 enquires about the presence of explosive outbursts in the past month, and questions 2–4 assess specific features of these outbursts (e.g., characteristic of child; verbal or physical attacks).

Missing data procedures were implemented for PTQ, SMFQ, SCAS, and PedsQL. On the PTQ, motor or vocal subscales missing two or fewer items were included in analyses. Missing data were interpolated by calculating the average score for a particular domain of tic severity (either frequency or intensity). Tic severity scores for a particular tic were only included if the tic reportedly occurred within the past week. For the following measures, missing data procedures described in the measure’s instructions were followed. SMFQs missing two or fewer items were included, and missing scores were interpolated using the

average item score. On the SCAS, measures missing four or fewer items were included in analyses. Missing data were interpolated by calculating the average item score for the measure. On the PedsQL-SF15, subscales missing less than 50% of items were included, and missing values were replaced with the mean score for the relevant subscale. On the RAQ, missing data were not interpolated due to the short length of the measure. RAQ data were included in analyses if the participant answered at least question 1 ( $N = 206$ , Victims = 55, Non-victims = 151).

### Analytic Strategy

“Victims” ( $N = 55$ ) included youth endorsing at least one question about peer victimization as “most of the time” or “all of the time,” comprising 26% of the 211 total participants. “Bullies” ( $N = 4$ ) included participants endorsing at least one question about being a bully as “most of the time” or “all of the time.” “Bully-Victims” ( $N = 1$ ) met criteria for both “Victims” and “Bullies”. “Non-victims” ( $N = 151$ ) included youth endorsing all questions about bullying others and being a victim of bullying as “never” or “sometimes.” Given small numbers for Bullies and Bully-Victims, responses from these subjects were eliminated from analyses.

Using descriptive analyses, we examined demographic characteristics and prevalence of peer victimization. Mean scores on several measures were compared across groups using two-tailed *t*-tests (PTQ, SCAS, SCAS:P, SMFQ, PedsQL:SF15, RAQ). Given the close relationship between urge and tic severity, a one-way ANCOVA controlling for tic severity was used to compare premonitory urge intensity across groups. Chi-square analyses were used to compare groups on explosive outbursts, presence vs. absence of co-occurring psychiatric diagnoses, treatment for tics, and coprophenomena (i.e., involuntary stereotypic obscene gestures or utterances). A stepwise multiple regression analysis was used to explore the relationship between peer victimization and explosive outbursts status.

## Results

### Demographic Characteristics

Victims and Non-victims were similar for age, gender, ethnicity, education level, annual household income, and parent marital status (Table 2). A significantly higher percentage of Victims reported co-occurring psychiatric diagnoses ( $\chi^2(1) = 5.4, p = 0.020$ ). Specifically, a significantly higher percentage of Victims reported co-occurring ADHD ( $\chi^2(1) = 8.3, p = 0.003$ ). The rate of reported disruptive behavior disorders (i.e., oppositional defiant disorder or conduct disorder) was not significantly different between Victim and Non-victim groups, ( $\chi^2(1) = 0.12, p = 0.725$ ). A higher percentage of Victims reported receiving treatment for tics but this difference was not statistically significant, ( $\chi^2(1) = 2.9, p = 0.084$ ). Parents of Non-victims reported higher level of education.

### Peer Victimization Questions

Of 53 Victims who endorsed being picked on, made fun of, called mean names, or mimicked, 88.6% ( $N = 47$ ) attributed this bullying to their tics. Of 39 Victims reporting that others picked fights or try to physically harm them, 71.7% ( $N = 28$ ) attributed this bullying to their tics. Sixty-three percent ( $N = 29$ ) of 46 Victims who reported being

**Table 2** Demographic characteristics of youth with TS/CTD: “Victims” and “Non-victims”

Characteristic	Victims (N = 55)	Non-victims (N = 151)
Gender, % (N)		
Male	72.7 (40)	85.4 (129)
Female	27.3 (15)	14.6 (22)
Age in years, mean (SD)	12.2 (2.2)	12.4 (2.2)
Ethnicity, % (N)		
White/Caucasian	83.6 (46)	84.1 (127)
African American	1.8 (1)	2.0 (3)
Hispanic/Latino	1.8 (1)	3.3 (5)
Asian	1.8 (1)	1.3 (2)
Multi-racial	9.1 (5)	5.3 (8)
Other	1.8 (1)	2.0 (3)
Grade level completed, mode (N)	6th (13)	5th (34)
Parent-reported formal diagnosis of co-occurring psychiatric disorder, % (N)	67.3 (37)*	49.0 (74)
ADHD	52.7 (29)**	30.5 (46)
Disruptive behavior disorder	10.9 (6)	9.3 (14)
Ever received tic treatment, % (N)	90.9 (50)	80.8 (122)
Annual household income in \$US, mode (N)	75,000 + (24)	75,000 + (89)
Parent education level, mode (N)	Technical college/ Associate’s degree (17)	Bachelor’s degree (41)
Parent marital status, % (N)		
Single/never married	0 (0)	2.6 (4)
Currently married	85.5 (47)	90.1 (136)
Separated	3.6 (2)	1.3 (2)
Divorced	9.1 (5)	5.3 (8)
Widowed	1.8 (1)	0.7 (1)

Demographic characteristics are based on self-report of peer victimization experiences

*TS/CTD* tourette syndrome or other chronic tic disorders

*ADHD* attention deficit hyperactivity disorder

\* Difference between victims and non-victims is statistically significant at  $p = 0.020$

\*\* Difference between victims and non-victims is statistically significant at  $p = 0.003$

gossiped about assigned the gossiping as related to their tics. Of 53 Victims who reported being purposely excluded from activities, 71.6% (N = 38) attributed this exclusion to their tics.

### Tic Symptoms

Mean tic severity PTQ total score was significantly higher in Victims than in Non-victims (Table 3). A one-way ANCOVA controlling for PTQ total score revealed a significant effect of group membership on PUTS total scores, ( $F(2, 80) = 7.9, p = 0.001$ ). PUTS mean scores were also significantly higher in Victims than in Non-victims. This finding, independent of actual tic severity, suggests Victims experience stronger premonitory urges than do Non-victims.



**Table 3** “Victims” versus “Non-victims” across symptom domains

Domain	Victims	Non-victims	Difference
Tic severity			
PTQ total, mean (SD)	57.7 (29.9, N = 27)	38.2 (18.6, N = 61)	$t(86) = 3.7^*$
Premonitory urge			
PUTS total, mean (SD)	24.3 (6.6, N = 54)	19.5 (7.2, N = 148)	$t(80) = 5.8^{**}$
Anxiety			
SCAS-C total, mean (SD)	37.0 (21.5, N = 50)	22.1 (14.4, N = 147)	$t(195) = 5.5^*$
SCAS-P total, mean (SD)	35.4 (18.2, N = 55)	24.4 (15.0, N = 50)	$t(203) = 4.4^*$
Depression			
SMFQ total, mean (SD)	11.6 (6.6, N = 54)	5.6 (4.8, N = 150)	$t(202) = 7.1^*$
Quality of life			
Youth PedsQL:SF15 total, mean (SD)	51.5 (18.1, N = 50)	73.2 (16.1, N = 145)	$t(193) = -7.9^*$
Parent PedsQL:SF15, total, mean (SD)	46.7 (16.2, N = 55)	64.5 (19.5, N = 151)	$t(193) = -7.9^*$
Explosive outbursts			
RAQ total, mean (SD)	2.3 (1.6, N = 55)	1.5 (1.6, N = 151)	$t(204) = 3.0^{***}$

*PTQ* parent tic questionnaire, *PUTS* premonitory urge for tics scale, *SCAS-C* spence child anxiety scale for children, *SCAS-P* spence child anxiety scale for parents, *SMFQ* short mood and feelings questionnaire, *PedsQL:SF15*: pediatric quality of life inventory:short form generic core scales, *RAQ* rage attack questionnaire

\*Significant at  $p \leq 0.001$

\*\*Significant at  $p = 0.001$

\*\*\*Significant at  $p = 0.003$

Dichotomous variables reflecting absence/presence of complex tics and coprophomina were created for each participant. Youth with any complex tics were 4.3 times more likely to be Victims than to be Non-victims, ( $\chi^2(1) = 12.1, p = 0.001$ ). Youth with coprophomina were 2.9 times more likely to be Victims than to be Non-victims, ( $\chi^2(1) = 5.9, p = 0.015$ ).

### Anxiety

The mean score for SCAS was significantly higher among Victims than among Non-victims (Table 3). A similar difference was observed for the parent report measure (SCAS:P) (Table 3), suggesting greater anxiety among Victims.

### Depression

Victims had a significantly higher mean score for SMFQ than did Non-victims (Table 3), suggesting greater mood disturbance in Victims.

### Quality of Life

For youth-report PedsQL:SF15, Victims had a significantly lower mean total score than did Non-victims (Table 3). Mean total scores on the parent-report PedsQL:SF15 were also significantly lower for Victims than for Non-victims (Table 3), indicating that Victims also suffer diminished health-related quality of life.

## Explosive Outbursts

Among respondents, parents of youth in the Victims group endorsed significantly more items on the RAQ than did parents of Non-victims (Table 3). Given this finding, we were interested in exploring whether particular types of peer victimization were associated with explosive outbursts in this sample of children with TS/CTD. Bully-victimization item responses were entered stepwise into a multiple regression equation with the total RAQ screen score (sum of items 1–4) as the dependent variable. Results indicate that the first bully victimization question (“Do other kids pick on you, make fun of you, call you mean names, or copy things you do in a mean way?”) was the only significant predictor of this dependent variable, ( $B = 0.70$ ,  $SE B = 0.29$ ,  $\beta = 0.25$ ,  $\Delta R^2 = 0.063$ ,  $p = 0.001$ ), accounting for 6% of the variance on the RAQ screen.

## Discussion

This study, the largest bullying investigation among youth with TS/CTD, reveals peer victimization as common. Victims report greater total tic severity and greater tic complexity (including coprophenomena) than Non-victims. Peer victim status is also associated with higher parental reports of internalizing symptoms (anxiety, depression) and explosive outbursts.

In addition, peer victimization is significantly associated with poorer quality of life, per both child and parent.

The behavioral model of TS/CTD [23] postulates that premonitory urges become more pronounced in those who encounter aversive consequences for committing tics (where increased urges, in turn, often lead to increased tic frequency). Results of the current study are consistent with this model (i.e., Victims had more intense premonitory urges, independent of tic severity) and should prompt future research addressing relationships between victimization, urges, and tic severity.

Although quite preliminary in nature, the observation that peer victimization appears associated with explosive outbursts also merits further study since such aggressive symptoms, when present, are considered among the most disabling aspects of TS/CTD [37]. Insights into the association between peer victimization and explosive outbursts, and how such associations interface with other dimensions of TS/CTD such as tic severity and psychiatric comorbidity, may inform additional meaningful interventions to screen for, reduce, and possibly even prevent aggressive symptoms in children with TS/CTD.

These findings suggest that reducing peer victimization may reduce the burden of TS/CTD. Potential mechanisms include improved: peer education to promote acceptance strategies for affected youth, families, and peers; tic suppression to reduce complexity and severity; and recognition and treatment of psychiatric comorbid conditions to enhance psychosocial competency. The association of reduced tic severity with improved psychosocial effects was recently reported in a study among children with TS/CTD that applied a behavioral intervention model designed as a treatment approach targeting tic expression, resulting in sustained total tic reduction measured at 6 months post-treatment. This reduction in tics was associated with improvement in psychosocial outcomes, including reduced anxiety [38]. Whether any associated change in peer victimization played a role in this improvement, however, was not explored.

## Limitations

The TS Impact Survey covered many topics broadly to collect a range of data from a large sample of youth with TS/CTD and their parents. As such, this project was foremost an exploratory investigation with the aim of generating additional hypotheses. A formal bullying assessment of randomly selected youth with TS/CTD and matched controls addressing multiple types of peer victimization (i.e., emotional/physical/property/sexual/relational) is an optimal research design. Our data may not characterize the general population of youth with TS/CTD. Gender interactions were not examined in the analyses comparing Victims with Bullies and with Non-victims because of limitation of sample size [39]. Cross-sectional data disallow viewing long-term effects of peer victimization.

Although group differences were found with respect to several variables (e.g., tic severity and complexity, internalizing symptoms, explosive outbursts), the directionality of this effect cannot be ascertained from the current study, such that it is unclear if peer victimization puts children at greater risk of worsened/additional symptoms or if children with worsened/additional symptoms are at greater risk of being victimized. In addition, the extent to which comorbid conditions are related to peer victimization, and the directionality of this relationship, also remain unclear. Although the current findings suggest that youth perceive that victimization is related to their tics, it is possible that other aspects of their behavior may contribute.

Employing youth self-reported responses to an anonymous online survey to classify participants as “Victim” versus “Non-victim” introduced the risk of shared-method variance and inflated associations between independent and dependent variables. Self-reports by youth in combination with peer and teacher reporting may provide more accurate representations [40] and should be considered in design methodology for future studies. Also, further analysis should consider potential association of current and past tic or other treatment (e.g., success or failure, side effects, non-adherence) and tic severity with peer victimization.

## Summary

This survey, the first and largest to address bullying/peer victimization in youth with TS/CTD, reveals that peer victimization is common in this population and appears associated with tic severity, urges, range of types of bullying, internalizing and externalizing symptoms and quality of life.

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