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The Role of Parental Perceptions of Tic Frequency and Intensity in Predicting Tic-Related Functional Impairment in Youth with Chronic Tic Disorders

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Abstract

Tic severity is composed of several dimensions. Tic frequency and intensity are two such dimensions, but little empirical data exist regarding their relative contributions to functional impairment in those with Chronic Tic Disorders (CTD). The present study examined the relative contributions of these dimensions in predicting tic-related impairment across several psychosocial domains. Using data collected from parents of youth with CTD, multivariate regression analyses revealed that both tic frequency and intensity predicted tic-related impairment in several areas; including family and peer relationships, school interference, and social endeavors, even when controlling for the presence of comorbid anxiety symptoms and Attention Deficit Hyperactivity Disorder diagnostic status. Results showed that tic intensity predicted more variance across more domains than tic frequency.

Keywords

Tic Disorders; Tourette Syndrome; Functional Impairment

Chronic Tic Disorders (CTD), including Tourette Syndrome (TS), are neurobiological conditions characterized by repetitive, stereotyped motor movements and/or sounds (1). Motor tics (e.g., blinking, head jerking, and facial grimacing) involve repetitive contractions of muscle groups and vocal (phonic) tics involve repetitive sounds (e.g., sniffing, grunting, throat clearing, and words or phrases). Tics occur more often in males than females (5:1) and are usually diagnosed around age seven (2). Studies estimate the prevalence of CTDs to be as high as 1–2% in community samples (3). As children with CTD grow older, tics may change in form and frequency. Tics often wane into adolescence and adulthood, and studies show roughly 25–66% of those diagnosed with TS experience tics into adulthood (4, 5).

Children with CTD report experiencing several psychosocial problems, including interference with school functioning (6), disrupted relationships with friends and family members (7, 8, 9, 10), and difficulties participating in social (11) and occupational (12) endeavors. Children with tic disorders may report problems in the classroom, while playing

sports or doing homework, and going to public places with their parents. Impairment in these areas, among others, may also lead individuals with CTD to seek treatment for their tics. Although there is a need for more research, some studies found that social and occupational problems may also be experienced by adults with TS (13, 14).

Significant questions remain however, as to the specific role tics play in psychosocial impairment, relative to the role of other psychiatric conditions that frequently co-occur with CTDs. The two most common co-occurring disorders in those with CTD are Attention-Deficit/Hyperactivity Disorder (ADHD) and Obsessive-Compulsive Disorder (OCD; 15). Research has shown that individuals with both TS and ADHD report greater functional impairment compared to individuals with TS alone, and those with both conditions also report higher levels of behavior problems and lower overall quality of life (16). In addition, Storch et al. (17), studied 59 youth with TS and found that 70% of reported problems in daily functioning were attributed to nontic-related impairment. Most often this impairment was related to co-occurring ADHD and OCD symptoms (17). Conelea et al. (18) reported similar findings in their study of 438 youth with CTDs, where the presence of a co-occurring psychiatric condition was found to confer greater risk of impairment in school, at home, with friends, and in other areas.

In addition to understanding the role of comorbidity status in functional impairment, research has also demonstrated that specific dimensions of tic expression may contribute to global functioning. For example, it has been found that tic frequency, intensity (19), and complexity (20) predict impairment in individuals with CTDs. Woods et al., (19) reported that actors displaying more frequent or intense tics (e.g., a quiet vocal tic versus a loud vocal tic) were viewed more negatively than peers with less frequent or intense tics. Woods and colleagues were not able to demonstrate, however, whether these negative perceptions would predict social impairment. Himle et al. (20) extended this line of research by predicting CBCL competency scores using YGTSS subscales, ADHD diagnostic scales, and an OCD symptom severity index. Of the five YGTSS subscales, the tic complexity score explained the greatest amount of variance in CBCL total competence scores in a stepwise regression analysis. Using hierarchical regression, the authors found that YGTSS tic complexity score remained a significant predictor of the variance in CBCL total competence scores, with ADHD diagnostic status and OCD symptoms in the model. Combined, results from existing studies suggest that, in addition to comorbid disorders, particular dimensions of tics may also predict functional impairment. If true, such information could guide the selection of appropriate targets in treatment.

Although the results of these studies indicate a potential role for intensity in predicting tic-related impairment, most studies of tic disorders historically use tic frequency (e.g., 21–24) or total scores (e.g., 25–27) on measures to assess severity at outcome. The primary goal of the present study was to examine the extent to which the dimensions of tic frequency and intensity predict functional impairment in a large internet sample (Tourette Syndrome Impact Project; TSIP) of individuals with tic disorders. We used the Parent Tic Questionnaire (PTQ; 28) to evaluate both tic frequency and intensity—the two dimensions assessed within the measure. Consistent with studies by Woods et al. (19), we hypothesized

that both tic frequency and intensity would contribute to functional impairment, even after accounting for general levels of anxiety and ADHD diagnosis.

Methods

This study was approved by the University of Wisconsin-Milwaukee Institutional Review Board. Data were originally collected as part of the TSIP in order to obtain more information about the presentation, course, impact, and comorbidity of tic disorders for individuals within the general population. Because a detailed account of the study methodology is available elsewhere (18), the following description only includes the areas pertinent to the present analysis.

Participants

Surveys were completed via a link embedded on the home page of the Tourette Syndrome Association (TSA; www.tsa-usa.org), emails sent through the TSA to patient members, and from a website described in a TSA newsletter. Data were collected from parents of youth with a CTD. To be included in the study, the parents' child had to be 10–17 years of age and diagnosed a chronic tic disorder as indicated by parents' responses to survey questions (e.g., "Has your child ever been diagnosed with Tourette Syndrome?"). Data from 740 parents or guardians were included in and fully described in Conelea et al. (18).

Of those 740, the present study only included data from the parents who had completed the entire Parent Tic Questionnaire. This includes questionnaires with complete data to calculate both Total Tic Frequency and Total Tic Intensity scores ($N = 524$). Unfortunately, it was not possible to determine why so many parents did not complete the Parent Tic Questionnaire in the present study. In the present sample, parents' age ranged from 24–63 years old ($M = 40.44$, $SD = 6.72$). Reporting parents identified as currently married ($N = 453$), divorced ($N = 46$), single/never married ($N = 13$), separated ($N = 8$), and widowed ($N = 3$). One parent did not report marital status. Child demographic data, as reported by the parents, is available in Table 1.

Materials

Tourette Syndrome Impact Survey—The Tourette Syndrome Impact Survey (TSIS) was modeled after previously-developed internet surveys (Trichotillomania Impact Survey; (29, 30). The TSIS included commonly used tic questionnaires and measures related to anxiety, Attention Deficit Hyperactivity Disorder (ADHD), family functioning, and quality of life.

Also included within the TSIS were ten items assessing tic interference across several areas of functioning. The questions covered physical as well as social functioning. Questions also asked about tic-related academic problems and tic-related avoidance. Responses for each of these questions occurred along a 10-point Likert scale (0–9), with lower scores indicating less impact in these domains. Parents also indicated whether their children had ever experienced pain or physical damage due to tics ("no" = 1, "yes" = 2). A complete list of the questions is available in Table 2.

Parent Tic Questionnaire—The Parent Tic Questionnaire (PTQ) is a parent-report measure with 14 common motor tics and 14 common vocal tics. Parents identify the tics that occurred in the past week and may also write in any additional tics not included on the list. Parents also rate both the frequency and intensity of each tic on Likert scales ranging from 1 to 4. For frequency, each of the numbers corresponds to a rating of constantly, hourly, daily, or weekly. For intensity, higher numbers indicate more intense, strong, and/or noticeable tics. The two scales are summed, yielding a score of 0–8 for each tic. Each tic score is summed to yield overall scores for motor (Range = 0–112) and vocal (Range = 0–112) tics. These two scores can also be summed for a composite score (Range = 0–224), which is frequently used as an outcome measure in studies of tic disorders (e.g., 31). Psychometric data from studies show the PTQ to have acceptable internal consistency ($\alpha = .90$), temporal stability (ICC = .84), and convergent and discriminant validity in a clinic sample (28). In the present study, internal consistency for the total frequency ($\alpha = .77$) and total intensity ($\alpha = .79$) scales were also in the acceptable range.

Spence Child Anxiety Scale—The Spence Child Anxiety Scale for parents (SCAS-P) is a 38-item parent-report measure to identify general symptoms of anxiety, in their children. Parents rate each symptom on a scale ranging from 0 (“never”) to 3 (“always”), for a total possible score of 114. Spence (32) demonstrated acceptable internal consistency ($\alpha = .92$), convergent and divergent validity, and temporal stability ($r = 0.60$) when developing and testing the SCAS.

ADHD—Given the electronic format of the study, the present study did not include a formal diagnostic assessment tool for ADHD. In the present sample, parents indicated whether or not their child had ever received a diagnosis of the disorder.

Results

Of the 524 parents included in the present study, over half reported their child experienced some tic-related pain and/or physical damage (65.6% yes, $M = 1.33$, $SD = .47$). Tics also had some impact on individuals’ social lives ($M = 4.62$, $SD = 2.65$) and close relationships with family ($M = 2.57$, $SD = 2.27$) and friends ($M = 3.95$, $SD = 2.71$). Responders also reported avoiding social events or entertainment ($M = 2.97$, $SD = 2.88$), group activities ($M = 2.99$, $SD = 2.97$), and public places ($M = 1.83$, $SD = 1.56$). Tics also interfered with daily activities such as school work ($M = 4.58$, $SD = 2.83$) and chores ($M = 3.80$, $SD = 2.49$) as well as the individuals’ ability to participate in private activities such as watching TV or reading a book ($M = 3.80$, $SD = 2.57$). In the present study, parents who completed the PTQ reported ($M = 42.57$, $SD = 45.94$) significantly higher overall impairment in their children compared to parents who did not complete the PTQ ($M = 22.58$, $SD = 31.87$), $F(1, 738) = 34.11$, $p < .001$.

Parent Tic Questionnaire

In addition to the composite total, total scores were summed for the items on the intensity, frequency, motor, and vocal subscales. Composite total scores on the PTQ ranged from 2–138 ($M = 37.82$, $SD = 24.03$). Total intensity scores ranged from 2–77 ($M = 21.71$, $SD =$

13.11), with a higher average for motor tics ($M = 13.45$, $SD = 8.17$) than vocal tics ($M = 8.25$, $SD = 6.60$). Total frequency scores ranged from 2–101 ($M = 24.18$, $SD = 14.12$) and also had a higher average for motor tics ($M = 15.07$, $SD = 9.22$) compared to vocal tics ($M = 9.11$, $SD = 6.93$).

Spence Child Anxiety Scale

The overall composite score ($M = 27.31$, $SD = 18.75$), was calculated. This mean is higher than the mean score observed in Spence's (32) non-clinical sample of children ($M = 18.80$, $SD = 9.72$), but lower than her social phobia ($M = 32.20$, $SD = 21.97$) and comorbid social and separation anxiety ($M = 48.75$, $SD = 17.66$) samples of children.

Predictors of Impact

Spearman Rank-order correlations were used to calculate the strength and direction of the relationships among impact areas, SCAS Total scores, ADHD diagnostic status, and PTQ Total Intensity, PTQ Total Frequency, and PTQ Total scores. The SCAS Total scores and all three PTQ scores were significantly correlated with all of the impact areas. ADHD diagnostic status was significantly correlated with all but two of the impact areas (Table 3). After breaking down total PTQ scores into total intensity and total frequency subscale scores, a series of ten linear regressions were conducted. Each analysis included one of the 10 impact areas as the dependent variable. Using the stepwise regression method, total SCAS score and ADHD diagnostic status were entered into all three blocks, PTQ total frequency into the second and third blocks, and PTQ total intensity into the third block. This allowed for the opportunity to determine whether PTQ frequency and intensity predicted any independent variance in impairment above and beyond problems associated with anxiety and ADHD. Although both total frequency and total intensity were significantly correlated ($r = .80$, $p < .01$), variance inflation factors and tolerance statistics were all in the acceptable range according to standard methods (33). Despite the inherent relationship between frequency and intensity of tics (a tic must be present before it can be rated as intense), the assumption of no multicollinearity was not violated in the current model.

Results showed total scores on the SCAS significantly predicted impairment in all impact areas except public places, even with the other predictors in the model. ADHD diagnostic status, however, was only a significant predictor of impairment in one impact area when all predictors were in the model. With all the predictors in the model, PTQ frequency scores significantly predicted impairment in only two of the ten impact areas, but PTQ intensity scores predicted impairment in seven of the ten areas.

For impact on family relationships, SCAS score ($\beta = .28$, $p < .01$), ADHD status ($\beta = .16$, $p < .05$) and PTQ Intensity ($\beta = .37$, $p < .01$) explained 19.7% of the variance ($R^2 = .19$, $F(4, 159) = 9.72$, $p < .01$). For school interference, SCAS score ($\beta = .17$, $p < .05$), PTQ Frequency ($\beta = -.27$, $p < .05$), and PTQ Intensity ($\beta = .47$, $p < .001$) explained 14.6% of the variance ($R^2 = .14$, $F(4, 151) = 6.43$, $p < .01$). For impact on chores, SCAS score ($\beta = .43$, $p < .01$), PTQ Frequency ($\beta = -.28$, $p < .05$), and PTQ Intensity ($\beta = .41$, $p < .01$) explained 29.5% of the variance ($R^2 = .29$, $F(4, 160) = 16.71$, $p < .01$).

Although PTQ Frequency scores did not significantly predict impact in any other areas of functioning, total scores on the SCAS and PTQ Intensity scores significantly predicted impairment in several other areas. For private leisure activities, SCAS score ($\beta = .35$, $p < .01$), and PTQ Intensity ($\beta = .33$, $p < .01$) explained 23.4% of the variance ($R^2 = .23$, $F(4, 160) = 12.23$, $p < .01$). For avoidance of public places, SCAS score ($\beta = .41$, $p < .01$), and PTQ Intensity ($\beta = .28$, $p < .05$) explained 25% of the variance ($R^2 = .25$, $F(4, 161) = 13.11$, $p < .01$). For avoidance of social entertainment, SCAS score ($\beta = .45$, $p < .01$), and PTQ Intensity ($\beta = .25$, $p < .05$) explained 28.8% of the variance ($R^2 = .28$, $F(4, 158) = 16.00$, $p < .01$). For impact on social life, SCAS score ($\beta = .30$, $p < .01$), and PTQ Intensity ($\beta = .33$, $p < .05$) explained 18.7% of the variance ($R^2 = .18$, $F(4, 161) = 9.24$, $p < .01$). For impact on close relationships with friends, SCAS score ($\beta = .28$, $p < .01$), and PTQ Intensity ($\beta = .36$, $p < .01$) explained 17.1% of the variance ($R^2 = .17$, $F(4, 160) = 8.27$, $p < .01$).

Impairment in the remaining two areas of impact, avoidance of group activities and pain/physical damage was not significantly predicted by ADHD status, PTQ Frequency, or PTQ Intensity scores. Total SCAS scores ($\beta = .18$, $p < .05$) predicted higher levels of reported pain/physical damage from tics and explained 9.7% of the variance ($R^2 = .09$, $F(4, 161) = 5.70$, $p < .01$). Total SCAS score ($\beta = .53$, $p < .05$) also significantly predicted higher levels of avoidance of group activities and explained 33.2% of the variance ($R^2 = .33$, $F(4, 159) = 19.78$, $p < .01$). For a complete breakdown of results, see Table 4.

Given the high number of regression analyses, we applied a Bonferroni correction to account for family-wise error rate for the tic-related predictors of frequency and intensity. After applying the correction, tic frequency did not significantly predict any of the 10 outcome variables. Tic intensity, however, remained a significant predictor of close relationships with friends, close relationships with family, home chores, and school interference.

Responses from each of the ten dependent variables were summed across subjects into one overall impairment variable. This allowed us to determine the contribution of each predictor on impairment as a whole. Reliability analyses showed acceptable levels of internal consistency across all 10 impairment items ($\alpha = .89$), and the overall impairment variable was significantly correlated with scores on the PTQ, the SCAS, and ADHD diagnostic status ($p < .01$; see Table 3). The overall impairment variable was then regressed on each predictor in the same order as the previous hierarchical regression analyses. Total SCAS scores and ADHD diagnoses were entered in all three steps, PTQ Frequency was entered in steps two and three, and PTQ Intensity was entered in step three. ADHD diagnostic status was not a significant predictor across all three steps. Total SCAS score remained significant in all three steps, and PTQ Frequency was a significant predictor in step two but not in step three when PTQ Intensity was entered. SCAS score ($\beta = .40$, $p < .01$), and PTQ Intensity ($\beta = .46$, $p < .01$) explained 34% of the variance ($R^2 = .34$, $F(4, 143) = 18.42$, $p < .01$) in total impairment scores.

Discussion

Results suggest that tic intensity predicts a significant amount of variance in tic-related functional impairment and is a stronger predictor than tic frequency. Above and beyond symptoms of anxiety and ADHD status, total tic intensity scores on the PTQ significantly predicted impairment in close relationships with friends and family, ability to do home chores, and school productivity. Tic intensity also predicted overall impairment when all of the impact measures were collapsed into one variable. Although clinical studies and experimental studies historically use tic frequency (21–24, 34, 35) or overall scores on measures (25–27) as dependent variables to measure tic severity, the current study suggests tic intensity may be a better predictor of tic-related functional impairment in youth with CTDs. These results hold even when accounting for comorbid anxiety, including OCD as measured by the SCAS, and ADHD diagnosis, both of which have been shown to predict functional impairment (18).

These findings are consistent with past research. Woods and colleagues (19) reported lower ratings of social acceptability for individuals with more intense tics. In that study, lower social acceptability ratings were also found for individuals with more frequent tics. However, unlike Woods et al., the current study found the negative effects of tic frequency were negated when we considered tic intensity. Intuitively, the fact that intensity may yield more impairment than frequency makes sense. An occasional violent head jerk or loud scream may be more disruptive or socially impairing than a frequent but discrete throat-clearing sound. The discrepancy between studies could also be an artifact of how tic frequency was measured across studies. Other studies have used semi-structured interviews such as the YGTSS to measure tic dimensions instead of parent-report measures such as the PTQ.

These findings may signify a potential need to develop more systematic assessment strategies to target tic intensity rather than frequency. For example, such strategies might include descriptions often associated with tic intensity (forcefulness, noticeability, deviation from regular movements). Although tic intensity is assessed in part as one of the subscales of the YGTSS, the question remains as to how well that subscale predicts tic-related impairment among individuals with TS. Combined with the results from Himle et al. (20), these findings may warrant future studies on the importance of evaluating YGTSS subscales on impairment. Additionally, what role does tic frequency serve in the assessment of tic disorders? In classic experimental designs using direct observation of tics, frequency is a practical way to measure tic severity that lends itself to interrater reliability measurements (e.g., 36, 37). Tic intensity may be a more subjective rating of tic severity, and may not lend itself as well to such methods. Future studies using direct observation of tics as outcome variables could explore the feasibility of such methods to measure tic intensity.

These findings also provide information that may be helpful during treatment planning. If time in treatment is limited, it may be beneficial to focus on the tics with higher intensity ratings than tics occurring more frequently. The treatment manual *Managing Tourette Syndrome* (38, p. 64), for example, instructs therapists to begin treating “the most bothersome tic that the clinician, patient, and her parents or significant others feel is most

likely to meet with success.” The first tic selected for treatment may or may not be the most intense, depending on the reports from the child and parents and subjective ratings of the clinician. Given the results of the present study, it may be pragmatic for clinicians to begin with the most intense tic. This may be challenging, however, if such judgment conflicts with that of the client or parents. Clinicians would also need to be sure to respect client autonomy when making such decisions.

Despite these promising findings, there are several limitations one must consider when interpreting the results. The first is the use of parent report, which results in a relatively narrow sampling of the child’s behavior. Second, the nature of the PTQ itself provides an important limitation. The PTQ asks about tic frequency and intensity in the *past week*. This is in contrast to the time period assessed by the impact questions. The impact questions ask about impairment across the nine domains in the *past year*. This temporal discrepancy between reporting periods could misrepresent the relationship between impairment and the various dimensions of tics, and make unclear the predictive direction of these relationships. Future studies should make every effort to ensure the two time periods are consistent. Third, ADHD and OCD, two common comorbid diagnoses in individuals with CTD, could have been assessed more systematically. Parents indicated whether or not their child had ever been diagnosed with ADHD through a yes/no response, and OCD was assessed along with general anxiety in the total score on the SCAS. Although the total SCAS scores in the current study were higher than the non-clinical sample from Spence’s original study, we did not use more systematic assessment methods to ensure clinical diagnosis. Future studies should incorporate more rigorous diagnostic tests to control for OCD and ADHD when evaluating the role of specific tic factors on functional impairment. Finally, diagnostic symptoms of reported tic disorders could not be confirmed by a clinician in person given the nature of the study.

Despite these limitations, if replications of the current study confirm intensity as an important measure of tic severity, treatment for tics, which often gauges success based on reducing tic frequencies (e.g., 23, 39–41) or composite scores (25, 26, 42), should insure the intervention adequately modifies the intensity dimension.

Summary

This study examined the contributions of tic frequency, intensity, and comorbid disorders to functional impairment in youth with chronic tic disorders. Impairment was assessed across a variety of psychosocial domains. These included close relationships with family, close relationships with friends, school interference, home chores, private leisure activities, public places, pain and/or physical damage due to tics, social entertainment activities, social life, and group activities. Using parent-report severity measures of tics, anxiety, and ADHD diagnosis, both tic intensity and comorbid anxiety were the best overall predictors of functional impairment. Both tic intensity and comorbid anxiety were also the best predictors when all of the psychosocial areas were collapsed into one overall impairment variable. These findings suggest that tic intensity may be a better indicator of problems in youth with chronic tic disorders than tic frequency—the variable historically measured in treatment

outcome studies. Future studies are needed to replicate these findings to determine whether intensity consistently drives impairment scores and is not just an artifact of parental report.

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Table 1

Children's Demographic Data as Reported by Parents (N = 524)

Characteristic	N
Gender	
Male	N = 436 (83%)
Female	N = 88 (17%)
Age	M = 10.49 (SD = 2.86)
Ethnicity	
White/Caucasian:	N = 450 (86%)
Hispanic/Latino	N = 18 (3%)
African American	N = 5 (1%)
Asian	N = 7 (1%)
Other:	N = 44 (9%)
Parent-Reported Lifetime Tic Diagnoses	
Tourette Syndrome	N = 508 (97%)
Chronic Vocal	N = 99 (19%)
Chronic Motor	N = 145 (28%)
Parent-Reported Lifetime Comorbid Disorders	
Attention Deficit	N = 189 (37%)
OCD	N = 189 (36%)
Disruptive Behavior	N = 39 (7%)
Social Phobia	N = 11 (2%)
Other Anxiety	N = 120 (22 %)
Learning	N = 60 (12%)
Pervasive Developmental	N = 30 (6%)
Sensory Integration	N = 30 (11%)
Major Depression	N = 57 (11%)
Bipolar	N = 20 (4%)
Mental Retardation	N = 5 (1%)
Trichotillomania	N = 6 (1%)
Skin Picking	N = 29 (6%)
Nail Biting	N = 36 (7%)
Eating	N = 4 (< 1%)
Somatoform	N = 1 (< 1%)
Other	N = 30 (6%)

Table 2**Impact Questions**

Area	Question from Survey
Close Relationships Family	In the last 12 months, how much did your child's tics interfere with his/her ability to form and keep close relationships with people who are relatives or family members?
School Interference	In the last 12 months, how much do you think tics interfered with your child's academic life?
Home Chores	In the last 12 months, how much do you think tics interfered with your child's/legal ward's ability to help around the house, such as do chores, look after other siblings, clean his/her room, etc.?
Private Leisure	In the last 12 months, how much did your child's tics interfere with his/her hobbies or leisure activities, such as reading for pleasure, watching TV, playing video games, collecting, etc.?
Public Places	How many times in the past 12-months has your child avoided going out into public places because of his/her tics?
Avoid Social Entertainment	How many times in the past 12-months did your child avoid social events or entertainment activities because of his/her tics?
Social Life	In the last 12 months, how much do you believe your child's tics interfere with his/her social life?
Close Relationships Friends	In the last 12 months, how much did your child's tics interfere with his/her ability to form and keep close relationships with people who are not relatives or family members?
Pain/Physical Damage	Has your child ever had tics that caused pain or physical damage?
Group Activity	How many times in the past 12-months has your child refrained from participating in group activities because of his/her tics?

Table 3

Correlations of Impact Variables with PTQ scales, SCAS scores, and ADHD

Impact Area Items	PTQ Total	PTQ Frequency	PTQ Intensity	SCAS	ADHD
Private Leisure	.43**	.26**	.35**	.41**	.06
Public Places	.30**	.18**	.25**	.45**	.11*
Group Activity	.34**	.20**	.24**	.56**	.18**
Pain/Physical Damage	-.34**	.23**	.26**	.22**	.07
Social Life	.43**	.22**	.31**	.36**	.15**
Close Relationships Friends	.43**	.19**	.29**	.34**	.17**
Close Relationships Family	.37**	.16**	.23**	.34**	.17**
Home Chores	.46**	.20**	.32**	.48**	.14**
School Interference	.34**	.25**	.34**	.39**	.15**
Total Impairment	.54**	.25**	.37**	.48**	.18**

* p<.05 (2-tailed),

** p<.01, (2-tailed)

Table 4

SCAS Total, ADHD, Tic Frequency, and Tic Intensity as Predictors of Impairment

	Close Relationships Family				School Interference				Home Chores				Private Leisure				Public Places			
	B	SE	B	R ²	SE	B	R ²	SE	B	SE	B	R ²	SE	B	SE	B	R ²	SE	B	R ²
Step 1				.15**				.07**				.24**					.17**			.22**
ADHD	.95	.38	.18*		.45	.45	.08		.39	.38	.07		.45	.39	.09		.37	.28	.10	
SCAS	.05	.01	.34**		.04	.01	.25**		.07	.01	.46**		.06	.01	.41**		.05	.01	.46**	
Step 2				.16				.08				.24					.20*			.22
ADHD	.98	.38	.19*		.49	.45	.09		.41	.38	.08		.54	.39	.10		.40	.28	.10	
SCAS	.05	.01	.33*		.04	.01	.23**		.07	.01	.48**		.06	.01	.39**		.05	.01	.44**	
PTQ-F	.01	.01	.06		.02	.01	.10		.01	.01	.06		.03	.01	.17*		.01	.01	.09	
Step 3				.20**				.14**				.30**					.23**			.25*
ADHD	.82	.38	.16*		.27	.44	.05		.22	.37	.04		.38	.39	.07		.30	.28	.08	
SCAS	.04	.01	.28**		.03	.01	.17*		.06	.01	.43**		.05	.01	.34**		.05	.01	.41	
PTQ-F	.04	.02	.24		.05	.02	.27*		.05	.02	.28*		.02	.02	.10		.02	.02	.14	
PTQ-I	.07	.02	.37***		.10	.03	.47***		.08	.02	.41***		.07	.03	.33**		.05	.02	.28*	
	Social Entertainment				Social Life				Close Relationships Friends				Pain/Physical Damage				Group Activity			
	B	SE	B	R ²	SE	B	R ²	SE	B	SE	B	R ²	SE	B	SE	B	R ²	SE	B	R ²
Step 1				.26**				.37**				.12**					.05*			.32**
ADHD	.70	.47	.10		.43	.40	.08		.41	.42	.07		.03	.07	.03		.76	.46	.11	
SCAS	.09	.01	.50**		.05	.01	.36**		.05	.01	.34**		.01	.002	.22**		.10	.01	.55**	
Step 2				.27				.39				.13					.09*			.33
ADHD	.74	.47	.11*		.50	.40	.09		.46	.42	.08		.01	.07	.01		.82	.46	.12	
SCAS	.09	.01	.49*		.05	.01	.34**		.05	.01	.33**		.01	.002	.20*		.10	.01	.54**	
PTQ-F	.02	.02	.09		.03	.01	.14		.02	.01	.10		.01	.002	.19		.02	.02	.09	
Step 3				.29*				.43*				.17**					.10			.33
ADHD	.61	.47	.09		.35	.40	.06		.29	.41	.05		.03	.07	.03		.74	.47	.10	

Social Entertainment					Social Life					Close Relationships Friends					Pain/Physical Damage					Group Activity				
B	SE	B	SE	R ²	B	SE	B	SE	β	B	SE	B	SE	R ²	B	SE	B	SE	β	B	SE	B	SE	R ²
SCAS	.08	.01		.45**	.04	.01			.30**	.04	.01			.28*	.01	.002			.18*	.10	.02			.53**
PTQ-F	.03	.03		-.12	-.02	.02			-.13	.04	.02			-.19	.01	.004			.04	.01	.03			-.02
PTQ-I	.06	.03		.25*	.07	.03			.33*	.07	.03			.36***	.01	.004			.19	.03	.03			.13

Total Impairment				
B	SE	B	SE	R ²
Step 1				.26**
ADHD	4.84	2.78		.13
SCAS	.51	.07		.49**
Step 2				.28*
ADHD	5.26	2.75		.14
SCAS	.48	.07		.47**
PTQ-F	.18	.09		.15*
Step 3				.34**
ADHD	3.72	2.67		.10
SCAS	.42	.07		.40**
PTQ-F	-.26	.14		-.22
PTQ-I	.63	.17		.46**

* p < .05,
** p < .01,
*** significant after Bonferroni