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Indicators of Social Competence and Social Participation Among US Children With Tourette Syndrome

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Abstract

Children with Tourette syndrome often have behavioral and social difficulties, which may be associated with co-occurring mental, emotional, or behavioral disorders. This study investigated social competence, including behavioral problems and social skills, and social activities between children with and without Tourette syndrome using a nationally representative sample. In the 2007 National Survey of Children's Health, parents reported on health care provider diagnosis of Tourette syndrome, co-occurring mental, emotional, or behavioral disorders, and indicators of social competence. Children aged 6–17 years with and without Tourette syndrome were compared. Most (78.7%) children with Tourette syndrome had a co-occurring mental, emotional, or behavioral disorder. Children with Tourette syndrome had significantly lower social competence,

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Author Contributions

RHB contributed to the study concept, data interpretation, and led the drafting and revising (he manuscript. MD contributed to the study concept, lead the analyses, and contributed to data interpretation, drafting and revising the manuscript. RL contributed to data interpretation, drafting and revising the manuscript. BB contributed to drafting and revising the manuscript. MF contributed to data analysis, drafting, and revising the manuscript. RG contributed to the study concept, data interpretation, and revising the manuscript. AL contributed to data interpretation, drafting and revising the manuscript.

Declaration of Conflicting Interests

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Supplemental Material

Supplemental material for this article is available online.

Ethical Approval

The study procedures were approved by the NCHS Ethics Review Board and the NORC Institutional Review Board; the Office of Management and Budget control number for the 2007 National Survey of Children's Health was 0920–0406. Verbal informed consent was obtained from all respondents.

exhibited by higher levels of behavior problems (mean score 11.6 for Tourette syndrome and 9.0 for no Tourette syndrome) and lower levels of social skills (mean 15.3) than children without a Tourette syndrome diagnosis (mean 17.1); however, these associations were no longer significant after controlling for co-occurring mental, emotional, or behavioral disorders. Moderate to severe Tourette syndrome was associated with the highest ratings of behavioral problems and the lowest ratings of social skills. Children with and without Tourette syndrome were equally likely to participate in social activities; the difference for children with moderate to severe Tourette syndrome being less likely to participate in activities compared to children with mild Tourette syndrome had a chi-square test *P* value of .05, In conclusion, Tourette syndrome was associated with lower social competence, particularly for children with moderate to severe Tourette syndrome. Monitoring social functioning and co-occurring conditions among children with Tourette syndrome, and referral for evidence-based interventions when needed, may benefit overall health and functioning.

Keywords

Tourette; children; social functioning; social participation; tics

Successful social relationships contribute to overall physical and mental health, whereas social deficits and poor social competence may put children at risk for difficult social interactions and problems, and negatively affect overall health.[1] Social competence, broadly defined by Blumberg and colleagues[2] as the “skills and behaviors necessary to get along with others and be well-liked,” has been shown to be positively associated with participation in social activities[2]; moreover, in a longitudinal study, participation in social activities, including extracurricular activities, was associated with increased social competence.[3] Children with mental, emotional, or behavioral disorders, such as Tourette syndrome (TS), are at risk for having poor social relationships. In addition to having tics, individuals with Tourette syndrome are at an increased risk for a number of co-occurring mental, emotional, or behavioral disorders, including attention-deficit hyperactivity disorder (ADHD), obsessive-compulsive disorder, anxiety, depression, and autism spectrum disorder,[4,5] which could affect the development and maintenance of social relationships and contribute to an overall lower social competence level compared to children without Tourette syndrome.[6–8] Thus, this article examines indicators of social competence and social participation among children with and without Tourette syndrome to help inform early identification and intervention efforts.

Previous studies related to social competence and Tourette syndrome have generally been small, limited to a single clinic setting, or lacked a control group, and results have been mixed. Some studies have reported social deficits, including impairment in picking up on social cues, limited reciprocal behavior, and difficulty with social engagement, among children with Tourette syndrome.[9,10] Other studies have shown that Tourette syndrome is related to challenges to peer relationships, including lower levels of popularity,[9,11] and higher levels of victimization by peers.[12] Few studies have looked at social competence specifically among children with Tourette syndrome and have reported mixed results.[13–15]

Inconsistent findings in previous studies might be partially explained by the role of Tourette syndrome severity and the presence of co-occurring disorders. Previous studies have reported that increased tic severity is associated with challenges to social relationships, including self-ratings of popularity,[9] increased risk of peer difficulties,[16] interference with social and family functioning, and peer victimization.[12] Other studies, however, have failed to show a relationship between tic severity and indicators of social competence.[13,17] In addition to considering the role of tic severity on social competence, a number of studies suggest that the symptoms of common co-occurring mental, emotional, or behavioral disorders, particularly ADHD, may be more predictive of social problems among children with Tourette syndrome than the presence of tics.[9,10,17,18] In one study, social competence specifically was lower among children with Tourette syndrome and co-occurring ADHD, whereas children with Tourette syndrome only were similar to children with no psychiatric diagnosis.[13] Among children with chronic tic disorders, peer victimization, interference with social activities, and avoidance of social events and group activities were associated with co-occurring disorders.[12,19]

Our primary objective was to investigate whether children with Tourette syndrome were more likely to have lower social competence and engagement, including more behavioral problems, lower social skills, and lower levels of participation in social activities, compared to children without Tourette syndrome using a large, nationally representative data source. In addition, we examined the role of Tourette syndrome severity and co-occurring mental, emotional, or behavioral disorders. In the current study, we used data from the 2007 National Survey of Children's Health,[20] the only nationally representative survey to include indicators related to social competence and Tourette syndrome.

Methods

The data analyzed for this report are from the 2007 National Survey of Children's Health,[20] which was funded and directed by the Health Resources and Services Administration and conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS). This survey used the State and Local Area Integrated Telephone Survey mechanism (https://www.cdc.gov/nchs/slaits/about_slaits.htm) and is a cross-sectional, random digit-dialed telephone survey of households that elicits parents' and guardians' (hereafter referred to as parents) responses regarding the health of a randomly selected child living in the household. The overall response rate for the 2007 National Survey of Children's Health was 46.7%.[20] NCHS provides sample weights that are used to produce nationally representative estimates for each variable; these weights include adjustments to account for differential rates of nonresponse across demographic subgroups. National Survey of Children's Health data are publicly available and can be obtained from the NCHS website (https://www.cdc.gov/nchs/slaits/nsch.htm). The study procedures were approved by the NCHS Ethics Review Board and the NORC Institutional Review Board; the Office of Management and Budget control number for the 2007 National Survey of Children's Health was 0920–0406. Verbal informed consent was obtained from all respondents.

The National Survey of Children's Health is designed to monitor the health of all noninstitutionalized children aged 0–17 years living within the United States. The survey

includes questions related to Tourette syndrome, other mental, emotional, or behavioral disorders, social competence, and social activities. The primary question about Tourette syndrome was as follows: “Has a doctor or other health care provider ever told you that [child’s name] had Tourette Syndrome, even if he/she does not have the condition now?” A brief description of Tourette syndrome was provided if the parent asked for additional information: “Tourette syndrome is a disorder that causes frequent sudden movements or sounds.” The same question format was used to ask about other mental, emotional, or behavioral disorders including ADHD, behavioral or conduct problems, depression, anxiety problems, and autism spectrum disorder (ASD). If a parent reported their child “ever” had Tourette syndrome, they were asked if the child currently had Tourette syndrome, and if so, they were asked if the Tourette syndrome was mild, moderate, or severe.

Social competence was measured with the eight-item National Survey of Children’s Health Social Competence Scale, developed specifically to measure social competence (ie, “skills and behaviors necessary to get along with others and be well-liked) as part of the National Survey of Children’s Health.[2] The National Survey of Children’s Health Social Competence Scale has 2 subscales, behavior problems and social skills, each composed of four questions.[2] Both behavior problems and social skills were included in the measures to capture both positive and negative behaviors that could contribute to social competence.[2] For the behavior problems subscale, parents were asked how often their child (1) argues too much, (2) bullies or is cruel or mean to others, (3) is disobedient, and (4) is stubborn, sullen, or irritable. Questions for the social skills subscale were whether (1) the child shows respect for teachers and neighbors, (2) gets along well with other children, (3) tries to understand other people’s feelings, and (4) tries to resolve conflicts with classmates, family, or friends. For each subscale question, parents were asked how often the item was true during the past month. Each question had 5 answer choices (never, rarely, sometimes, usually, and always), with an item-level value ranging from 1 (never) to 5 (always) and overall subscale scores ranging from 4 to 20 based on a summation of the responses. Higher scores on the behavior problems subscale indicate more behavioral problems and higher scores on the social skills subscale indicate better social skills; no overall social competence score is calculated, following the approach of the initial development and description of the National Survey of Children’s Health Social Competence Scale.[2] Respondents were excluded from the subscale analysis if they were missing data for any of the individual items in the subscale. Questions about participation in organized social activities over the past 12 months included whether a child spent time participating in sports or sports lessons, clubs or organizations, or organized events or activities (respondents were excluded from this indicator if the child had missing values for all 3 questions), and whether a child spent time volunteering or performing community service. Parents were also asked whether the child earned money from work in the past week. Questions about volunteering and earning money from work were only asked of parents with children aged 12–17 years.

The analyses presented here are restricted to the responses by parents of children aged 6–17 years (n = 64 034) and focus on children who ever had a parent-reported Tourette syndrome diagnosis compared to those without Tourette syndrome. Weighted population estimates with 95% confidence intervals (CIs) for children with and without Tourette syndrome are reported and compared using chi-square tests for the following demographic factors: child’s

sex, race/ethnicity (non-Hispanic white, other race/ethnicity), age (6–11 years, 12–17 years), household poverty status (less than or equal to 200% of the federal poverty level, greater than 200% federal poverty level), and parent report of co-occurring mental, emotional, or behavioral disorders. Mental, emotional, or behavioral disorders, based on parent report of "ever" having the disorder, were categorized as externalizing (ADHD, behavioral or conduct problems), internalizing (anxiety problems, depression), and autism spectrum disorder. Household income, used to determine the federal poverty level, was missing for 8.4% of the analytic sample; therefore, 5 sets of publicly available multiply imputed values for federal poverty level were incorporated into these analyses. Means and 95% CIs for individual items on the social competence scale are presented along with the overall subscale scores for behavioral problems and social skills. Percentages and 95% CIs are presented for participation in social activities. Comparisons of social competence subscale scores and social activities for children with and without Tourette syndrome were tested using *t* tests and chi-square tests. Additionally, the effect of the relationship between Tourette syndrome status and participation in activities on scores of behavioral problems and social skills was tested using an interaction term in a linear regression (alpha < 0.05). One-way analyses of variance (ANOVAs) were used to compare estimates of the social competence by "ever Tourette syndrome," "mild current Tourette syndrome," and "moderate to severe current Tourette syndrome"; the percentage of children participating in social activities was compared across these groups using chi-square tests. Separate linear regression models were used to model the association between each of the social competence subscales (behavioral problems and social skills; dependent variables) and Tourette syndrome status (independent variable) after adjusting for all demographic factors considered in this study (sex, age, race, poverty status); the models were also run with the inclusion of the presence of any co-occurring externalizing disorders, internalizing disorders, or autism spectrum disorder as covariates. In addition, the interaction of each type of disorder (externalizing, internalizing, and autism spectrum disorder) with Tourette syndrome on behavioral problems and social skills was tested using an interaction term in a linear regression. Estimates that have a relative standard error (RSE; defined as the standard error divided by the estimate) greater than 30% are considered unstable and should be interpreted with caution; these estimates are identified by a note in the tables. All analyses were completed with SAS-Callable SUDAAN version 11.0.1 (RTI International, Durham, NC) to account for the complex survey design and the sample weights.

Results

As previously reported[21] and shown in Table 1, Tourette syndrome was more common in boys and non-Hispanic white children. Children with Tourette syndrome were more likely to be in the 12- to 17-year age group (69.5%) compared to children without Tourette syndrome (51.4%; $P = .01$). Household poverty status did not differ between children with or without Tourette syndrome ($P = .91$). Children with Tourette syndrome were significantly more likely to have any co-occurring mental, emotional, or behavioral disorder compared to children without Tourette syndrome (78.7% vs 16.4%, respectively; $P < .001$). Specifically, compared to children without Tourette syndrome, children with Tourette syndrome were more likely to have externalizing disorders (Tourette syndrome: 70.1% vs no Tourette

syndrome: 12.5%; $P < .0001$), internalizing disorders (Tourette syndrome: 52.6% vs no Tourette syndrome: 7.7%; $P < .0001$), and autism spectrum disorder (Tourette syndrome: 26.2% vs no Tourette syndrome: 1.8%; $P = .006$, see Table 1). Among children who had ever received a Tourette syndrome diagnosis, 62.4% were reported to have current Tourette syndrome; of these 72.9% had mild Tourette syndrome and 27.1% had moderate or severe Tourette syndrome.

Overall, the 2 social competence subscales, behavioral problems and social skills, were correlated with each other (correlation coefficient = −0.463; $P < .0001$), indicating a moderate inverse relationship between the 2 subscales (ie, children with more behavior problems have lower scores for positive social skills). Children with Tourette syndrome, on average, had higher overall behavioral problems scores (mean=11.6, CI: 10.6, 12.6) compared to children without Tourette syndrome (mean=9.0, CI: 8.9, 9.0, $P < .0001$; Table 2, Figure 1). Children who ever had a Tourette syndrome diagnosis also had a lower overall social skills score (mean=15.3, CI: 14.7, 16.0) compared to children who have never had a Tourette syndrome diagnosis (mean=17.1, CI: 17.0, 17.1, $P < .0001$). Children with Tourette syndrome were significantly more likely to exhibit each of the individual behavioral problems (eg, argues too much, bullies or is cruel to others, is disobedient, is stubborn), and significantly less likely to exhibit each of the positive social skills (shows respect toward adults, gets along with other children, tries to understand others' feelings, tries to resolve conflicts; see Table 2) than their peers without Tourette syndrome. Despite the differences in social competence scores, children with Tourette syndrome were similar to those without Tourette syndrome in their participation in organized social activities (such as sports, clubs, or other events and activities), volunteer activities, and working for money. However, a statistically significant interaction was observed between Tourette syndrome status and participation in activities for mean social skills score whereas the difference in mean social skills score for children with Tourette syndrome who did and did not participate in activities (15.9 vs 12.4, respectively) was larger than the corresponding difference for children without Tourette syndrome (mean=17.2 and 16.6, respectively; interaction term $P < .0001$; Table 1). No other statistically significant interactions between Tourette syndrome status and the other participation variables for the association with behavioral problems and social skills were identified.

Current Tourette syndrome severity was associated with indicators of social competence and participation in social activities (Table 3, Figure 1). Overall behavioral problems and overall social skills differed significantly across the 3 groups: children with current moderate or severe Tourette syndrome, children with current mild Tourette syndrome, and children with ever but not current Tourette syndrome. For behavioral problems, only the "argues too much" question differed by severity (highest for those with moderate to severe Tourette syndrome). Conversely, groups differed on mean scores for individual items on the social skills subscale by severity of Tourette syndrome; these differences were statistically significant for each item with the exception of "shows respect for teachers and neighbors." Overall behavioral problems were highest among children with current moderate to severe Tourette syndrome (mean=13.5, confidence interval [CI]: 12.1, 13.9) compared to those with current mild Tourette syndrome (mean=11.4, CI: 9.7, 13.2) and those with ever, but not current Tourette syndrome (mean=10.9, CI: 9.4, 12.4; $P = .03$). Conversely, overall social

skills were lowest among children with current moderate to severe Tourette syndrome (mean=12.1, CI: 10.8, 13.4) compared to those with current mild Tourette syndrome (mean=16.2, CI: 15.4, 17.0) and those with ever, but not current Tourette syndrome (mean=15.8, CI: 15.1, 16.4; $P < .001$).

The association of Tourette syndrome severity with participation in activities indicated that children with moderate/severe current Tourette syndrome were less likely to participate in activities than children with mild current Tourette syndrome or children with ever, but not current Tourette syndrome ($P = .05$, Table 3), although the estimate for the moderate to severe group had a relative standard error of 33%, and therefore should be interpreted with caution. Differences in estimates for volunteering and earning money for work did not reach statistical significance across severity groups ($P = .08$ for both).

Linear regression analyses controlling for demographic indicators showed significant associations between having a Tourette syndrome diagnosis and increased behavioral problems (Beta = 2.6, $P < .0001$) and decreased overall social skills (Beta = −1.6, $P < .0001$). The association between Tourette syndrome and behavioral problems and social skills was no longer significant when also controlling for the presence of externalizing disorders, internalizing disorders, or autism spectrum disorder (Table 4; when controlling for both demographic indicators and presence of mental, emotional, or behavioral disorders, coefficients for Tourette syndrome had relative standard errors greater than 50% and are therefore not reliable and should not be used except for inferential statistics). After controlling for Tourette syndrome and the other disorder categories, externalizing and internalizing disorders were both significantly associated with increased behavior problems and decreased social skills while autism spectrum disorder was associated with lower social skills only. No statistically significant interaction was observed between Tourette syndrome and co-occurring externalizing disorders, internalizing disorders, or autism spectrum disorder on behavioral problems or social skills (Table 2), indicating that the relationship between each type of co-occurring disorder and behavioral problems or social skills was not different for children with Tourette syndrome compared to those without Tourette syndrome.

Discussion

This study found that social competence was lower, on average, among children whose parent reported the child had ever received a Tourette syndrome diagnosis. Children with a history of Tourette syndrome had more behavior problems and fewer social skills than children who had never had a Tourette syndrome diagnosis. These findings were no longer statistically significant after controlling for demographics and co-occurring internalizing, externalizing, and autism spectrum disorders. Increased Tourette syndrome severity was associated with increased overall behavior problems, lower social skills, and less participation in social activities, compared to children with mild Tourette syndrome or past, but not current, Tourette syndrome, though the difference for participation in social activities had a P value right at the traditional threshold of statistical significance (0.05) and should be interpreted accordingly.

The negative impact of co-occurring ADHD on the social competence of children with Tourette syndrome has been established.[10,18] Relative to ADHD, less has been reported in the literature on the role of autism spectrum disorder on social competence among children with Tourette syndrome. Recent studies have demonstrated an increased risk of social deficits, as well as increased risk for autism spectrum disorder among children with tic disorders.[5,10] In this study, 26.2% of children with ever-diagnosed Tourette syndrome also had been previously diagnosed with autism spectrum disorder, which is similar to other studies that reported approximately 22% of children with Tourette syndrome or other tic disorders might also meet criteria for autism spectrum disorder.[5,22] High estimates of autism spectrum disorder among children with tic disorders may be related to challenges in differentiating tic or obsessive-compulsive symptoms from autism spectrum disorder symptoms.[5] In this study specifically, estimates of Tourette syndrome and autism spectrum disorder co-occurrence are based on parent report of a health care diagnosis, and may not capture changes in diagnosis, or misdiagnosis. In a previous study using the Social Responsiveness Scale to measure social deficits common among children with autism spectrum disorder, children with chronic tic disorders had elevated (ie, problematic) scores in each of the social domains often characteristic of autism spectrum disorder, including social awareness, social cognition, social communication, social motivation, and autistic mannerisms.[10] The current study shows that the presence of externalizing and internalizing disorders were associated with overall behavioral problems, though not more so for children with Tourette syndrome compared to their peers. Similarly, children with externalizing or internalizing disorders or autism spectrum disorder had lower overall social skills regardless of whether they had Tourette syndrome. Given that more than three-quarters of children with Tourette syndrome also had a co-occurring externalizing or internalizing disorder or autism spectrum disorder, careful assessment and monitoring of Tourette syndrome, co-occurring disorders, and social competence, as recommended in the American Academy of Child and Adolescent Psychiatry (AACAP) Practice Parameter for Tic disorders,[23] could improve diagnostic accuracy, and determine when children might need help improving social skills.

Despite having lower overall social competence, children with Tourette syndrome did not differ from those without Tourette syndrome in regard to time spent doing social activities, volunteering, or earning money for work. However, a differential relationship by Tourette syndrome status between mean social skills score and participation in activities was identified. Specifically, children with Tourette syndrome who did not participate in activities had lower social skills compared to children with Tourette syndrome who did participate in activities; the magnitude of this difference was larger than the corresponding difference between children without Tourette syndrome who did or did not participate in activities. In addition, because the quality of participation was not assessed, the children with Tourette syndrome may have lower quality of social interaction within the social activities compared to children without Tourette syndrome. In addition, children with current moderate to severe Tourette syndrome had lower participation in social activities compared to children with current mild Tourette syndrome or children with ever, but not current, Tourette syndrome; however, this difference had a *P* value of .05 and may need to be corroborated with other studies. If the finding of an association between Tourette syndrome severity and social

participation is confirmed, children with more severe Tourette syndrome might benefit from additional support to improve both their social competence and social participation.

Previous studies have documented that lower social competence among children with Tourette syndrome is associated with elevated social anxiety, depression, family problems, and lower health-related quality of life.[13,14] Additionally, social deficits in children with chronic tic disorders has been shown to play a larger role than tic severity on quality of life, social problems, and internalizing problems.[10] Thus, identifying challenges related to social competence among children with Tourette syndrome, may be relevant not only for identifying children who could benefit from interventions that may lead to improvements in social functioning, but also those who may need support in other domains (eg, addressing family problems or anxiety).

Treatments for Tourette syndrome typically focus on reducing tics, rather than secondary concerns, like social competence; however, social support is one component of habit reversal therapy, an effective behavioral treatment for Tourette syndrome.[23] For example, *Living with Tics*, a behavioral intervention that includes a focus on psychosocial aspects of Tourette syndrome, was recently piloted as an open-label trial and resulted in reduced tic-related impairment and improved quality of life in children receiving the treatment.[24] Because children spend a significant amount of time in school, psychoeducation of school staff and students to help improve social-emotional support of students with Tourette syndrome may provide a more supportive school environment for school-aged children with Tourette syndrome.[25] Behavioral and medication treatments for Tourette syndrome and co-occurring disorders have been reviewed as part of the AACAP practice parameter for tic disorders and the American Academy of Neurology practice guideline.[23,26]

The findings presented in this report should be interpreted within the context of certain limitations. First, all data presented are based on parent-report, and the presence of a Tourette syndrome or other mental, emotional, or behavioral disorder diagnosis has not been validated by clinical judgement or verified with medical records. The parent-reported information on co-occurring disorders was also limited to questions about selected disorders. Notably, obsessive-compulsive disorder, which commonly co-occurs with Tourette syndrome[4] and is associated with increased social problems among children with Tourette syndrome,[27] was not asked about on the National Survey of Children's Health. Although obsessive-compulsive disorder may have been reported as "anxiety problems" there is no way to determine that from these data; therefore, its contribution to lower social competence among children with Tourette syndrome could not be determined. Furthermore, the National Survey of Children's Health did not include questions about symptoms associated with diagnosed disorders (eg, inattention or hyperactivity associated with ADHD) and therefore conclusions were limited to the association between outcomes and disorder diagnosis and cannot be attributed to specific symptoms. A second set of limitations is that social competence indicators were reported by a single reporter, and may only reflect the parent's interpretation of their child's behavior that they have observed and been told about, and not the child's complete experience. In addition, parents were asked to report on social competence indicators based on the past month, while Tourette syndrome diagnosis was based on "ever" having been diagnosed with Tourette syndrome. Third, the response rate to

the National Survey of Children's Health was relatively low and may be subject to response bias; however, sample weights were constructed and used to adjust for nonresponse, as well as for noncoverage of children in nonlandline telephone households.[20] Furthermore, a nonresponse analysis found no consistent evidence of significant bias across indicators included, suggesting that weighted estimates are unlikely to be substantially affected by nonresponse.[28] No other nationally representative studies on children include questions both about Tourette syndrome and social competence; therefore, the results presented in this report include the only nationally representative data available with both sets of indicators.

Despite these limitations, the findings reported here, based on a large, nationally representative sample of US children, suggest that social competence is often impaired among children with Tourette syndrome and co-occurring mental, emotional, or behavioral disorders. Social competence is associated with overall health, mental health, family functioning, and health-related quality of life.[1,2,8,15] Thus, as recommended by the AACAP practice parameter, monitoring social functioning and co-occurring disorders among children with Tourette syndrome may identify specific areas for intervention.[23] Early identification of social competence problems, and referral for evidence-based treatment to improve social competence, may improve the health and functioning of children with Tourette syndrome.[1]

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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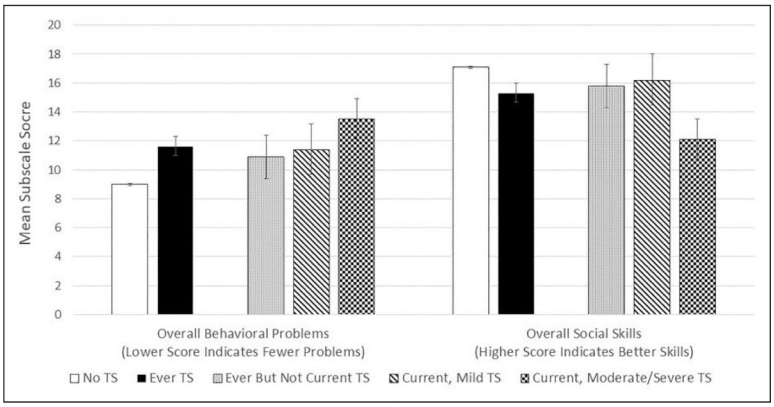

Figure 1.

Subscale scores for overall behavioral problems and social skills by history of Tourette syndrome (TS) diagnosis status and by current TS status and current severity of TS among US children aged 6–17 years.

Table 1.

Characteristics of US Children Aged 6–17 Years With and Without Parent Report of Ever Being Told by a Health Care Provider That Their Child Had Tourette Syndrome.[a]

	Ever Tourette syndrome (unweighted n = 225)	No Tourette syndrome (unweighted n = 63 809)	
	Weighted percent (95% CI)	Weighted percent (95% CI)	*P* value
Sex			
Male	75.4 (59.8, 86.3)	51.1 (50.1–52.1)	.0009
Female	24.6 (13.7, 40.2)	48.9 (47.9, 49.9)	
Age, y			
6–11	30.5 (20.1, 43.5)	48.6 (47.6, 49.6)	.01
12–17	69.5 (56.5, 79.9)	51.4 (50.4, 52.4)	
Race			
Non-Hispanic white	74.2 (61.6, 83.7)	57.2 (56.1, 58.2)	.01
Other	25.8 (16.3, 38.4)	42.8 (41.8, 43.9)	
Poverty status[b]			
≤200% FPL	38.7 (25.2, 54.1)	37.8 (36.8, 38.8)	.91
>200% FPL	61.3 (45.9, 74.8)	62.2 (61.2, 63.2)	
Ever MEB disorder[c]	78.7 (68.4, 86.3)	16.4 (15.7, 17.2)	<.0001
Ever EXT[d]	70.1 (57.1, 80.4)	12.5 (11.9, 13.1)	<.0001
Ever INT[e]	52.6 (38.5, 66.3)	7.7 (7.2, 8.3)	<.0001
Ever ASD	26.2 (14.4, 42.8)	1.8 (1.5, 2.0)	.006

Abbreviations: ASD, autism spectrum disorder; CI, confidence interval; EXT, externalizing disorder; FPL, federal poverty level; INT, internalizing disorder; MEB, mental, emotional, or behavioral disorder.

[a]Data source: 2007 National Survey of Children's Health.

[b]Multiple imputation used to estimate value for respondents with missing data on household income (8.4% were missing).

[c]Parent report of being told by a health care provider that their child has I or more MEB disorder (including externalizing, internalizing, or autism spectrum disorder.

[d]Including parent report of health care provider diagnosed attention-deficit hyperactivity disorder (ADHD) or behavioral problems.

[e]Including parent report of health care provider diagnosed depression or anxiety problems.

Table 2.

Social Competence and Social Activity indicators by History of Tourette Syndrome Diagnosis Status Among US Children Aged 6–17 Years.[a]

	Ever Tourette syndrome (unweighted n = 225)	No Tourette syndrome (unweighted n = 63 809)	
	Weighted mean (95% CI)	Weighted mean (95% CI)	*P* value[b]
Social competence subscales			
Overall behavioral problems[c]	11.6 (10.6, 12.6)	9.0 (8.9, 9.0)	<.0001
Argues too much	3.4 (3.1, 3.7)	2.8 (2.8, 2.8)	<.0001
Bullies or is cruel or mean to others	2.3 (1.8, 2.8)	1.5 (1.5, 1.6)	.003
Is disobedient	2.6 (2.4. 2.9)	2.1 (2.1, 2.1)	.0002
Is stubborn, sullen, or irritable	3.3 (3.0. 3.6)	2.5 (2.5, 2.5)	<.0001
Overall social skills[d]	15.3 (14.7, 16.0)	17.1 (17.0, 17.1)	<.0001
Shows respect for teachers and neighbors	4.1 (3.9, 4.4)	4.6 (4.6, 4.7)	<.0001
Gets along well with other children	4.2 (4.0, 4.4)	4.4 (4.4, 4.5)	.04
Tries to understand other people's feelings	3.6 (3.2, 4.0)	4.1 (4.1, 4.1)	.02
Tries to resolve conflicts with classmates, family, or friends	3.4 (3.2, 3.6)	3.9 (3.9, 3.9)	<.0001
Social activities	Weighted % (95% CI)	Weighted % (95% CI)	
Participates in organized social activities	81.9 (70.0, 89.8)	80.6 (79.7, 81.4)	.79
Volunteers (children aged 12–17 y)	73.9 (60.5, 84.0)	78.1 (76.8, 79.2)	.46
Earns money for work (children aged 12–17 y)	32.8 (17.2, 53.3)	40.4 (39.1, 41.7)	.42

Abbreviation: CI, confidence interval.

[a]Data Source: 2007 National Survey of Children's Health.

[b]For social competence subscales, *P* values are from *t* tests. For percentage of children participating in social activities, the *P* values are from chi-square tests.

[c]For behavioral problems, higher numbers represent more problems (scores range from 4 to 20).

[d]For social skills, higher numbers represent better social skills (eg, lower numbers represent worse social skills; scores range from 4 to 20).

Table 3.

Social Competence and Social Activity Indicators by Current Tourette Syndrome (TS) Status and Current Severity of Tourette Syndrome Among US Children Aged 6–17 Years.[a]

	Ever but not current TS (unweighted n = 73)	Current, mild TS (unweighted n = 102)	Current, moderate-severe TS (unweighted n = 43)	
	Weighted mean (95% CI)	Weighted mean (95% CI)	Weighted mean (95% CI)	*P* value[b]
Overall behavioral problems[c]	10.9 (9.4, 12.4)	11.4 (9.7, 13.2)	13.5 (12.1, 14.9)	.03
Argues too much	3.1 (2.5, 3.6)	3.3 (3.0, 3.6)	4.3 (3.7, 4.8)	.003
Bullies or is cruel or mean to others	2.0 (1.8, 2.3)	2.4 (1.4, 3.4)	2.5 (2.0, 3.0)	.24
Is disobedient	2.6 (2.0, 3.2)	2.5 (2.2, 2.8)	3.1 (2.7, 3.4)	.07
Is stubborn, sullen, or irritable	3.2 (2.8, 3.6)	3.2 (2.5, 3.9)	3.8 (3.5, 4.1)	.07
Overall social skills[d]	15.8 (15.1, 16.4)	16.2 (15.4, 17.0)	12.1 (10.8, 13.4)	<.0001
Shows respect for teachers and neighbors	4.2 (4.0, 4.5)	4.2 (3.7, 4.7)	3.7 (3.2, 4.2)	.21
Gets along well with other children	4.3 (4.0, 4.7)	4.5 (4.2, 4.7)	3.3 (2.7, 3.9)	.003
Tries to understand other people's feelings	3.8 (3.5, 4.0)	3.9 (3.5, 4.4)	2.5 (1.6, 3.4)	.01
Tries to resolve conflicts with classmates, family, or friends	3.5 (3.2, 3.8)	3.6 (3.3, 3.9)	2.7 (2.2, 3.2)	.005
Social activities	Weighted % (95% Cl)	Weighted % (95% Cl)	Weighted % (95% Cl)	
Participates in organized social activities	86.5 (71.7, 94.2)	94.9 (88.2, 97.9)	40.1 (18.4, 66.6)[e]	.05
Volunteers (children aged 12–17 y)	77.8 (57.2, 90.2)	80.1 (60.0, 91.5)	35.8 (16.1, 61.8)[e]	0.08
Earns money for work (children aged 12–17 y)	10.0 (4.2, 22.0)[+]	53.6 (28.3, 77.2)	33.7 (13.1, 63.0)[e]	0.08

Abbreviation: CI, confidence interval.

[a]Data Source: 2007 National Survey of Children's Health.

[b]For social competence subscales, *P* values are from I-way analyses of variance (ANOVAs). For percentage of children participating in social activities, the *P* values are from chi-square tests.

[c]For behavioral problems, higher numbers represent more problems (scores range from 4 to 20).

[d]For social skills, higher numbers represent better social skills (eg, lower numbers represent worse social skills; scores range from 4 to 20).

[e]Relative standard error for estimates are between 30% and 45%; estimates are not reliable and should not be used except for inferential statistics (eg comparison with other estimates).

Table 4.

Linear Regression Estimates for Indicators of Social Competence Associated With a History of Tourette Syndrome Among US Children Aged 6–17 Years.[a]

	Linear regression controlling for demographic indicator[b]			Linear regression controlling for demographic indicators[b] and presence of an externalizing disorder, an internalizing disorder or ASD		
	Beta	**95% CI**	***P* value**	**Beta**	**95% CI**	***P* value**
Overall behavioral problems						
Tourette syndrome	2.6	1.6, 3.6	<.0001	0.8[c]	−0.1, 1.7	.08
Ever EXT[d]				2.2	2.0, 2.4	<.0001
Ever INT[e]				1.3	1.0, 1.5	<.001
Ever ASD				0.4	−0.2, 1.0	.23
Overall social skills						
Tourette syndrome	−1.6	−2.3, −0.9	<.0001	−0.1[c]	−0.9, 0.7	.79
Ever EXT[d]				−1.5	−1.7, −1.3	<.0001
Ever INT[e]				−0.7	−0.9, −0.5	<.0001
Ever ASD				−1.6	−2.2, −1.1	<.0001

Abbreviations: CI, confidence interval; EXT, externalizing disorders; INT, internalizing disorders; ASD: autism spectrum disorder.

[a]Data Source: 2007 National Survey of Children's Health.

[b]Demographic indicators included in the linear regression include sex, age, poverty status, race/ethnicity. All linear regression model analyses included the incorporation of complex survey design variables and sample weights.

[c]Relative standard error (RSE) greater than 50%; estimates are not reliable and should not be used except for inferential statistics (eg comparison with other estimates).

[d]Included in these analyses were attention-deficit hyperactivity disorder (ADHD) and behavioral or conduct problems.

[e]Included in these analyses were depression and anxiety problems.