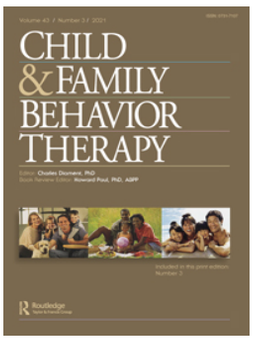

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ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/wcfb20

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To cite this article: Jordan T. Stiede, Douglas W. Woods, Seonaid Anderson, Valsamma Eapen, Ella Gev, Robyn Latimer & Aud M. Bredesen (2021) Cultural Differences in Reactions to Tics and Tic Severity, Child & Family Behavior Therapy, 43:3, 161-180, DOI: 10.1080/07317107.2021.1940586

To link to this article: https://doi.org/10.1080/07317107.2021.1940586

CHILD & FAMILY BEHAVIOR THERAPY
2021, VOL. 43, NO. 3, 161–180
https://doi.org/10.1080/07317107.2021.1940586

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Cultural Differences in Reactions to Tics and Tic Severity

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ABSTRACT

The present study used parent-report data to explore cross-cultural similarities and differences in tic severity and reactions to tics across 223 children with Tourette's disorder (TD) from the United States, United Kingdom, and Netherlands/Norway. Psychometric properties of the TARS-PR and PTQ were also examined and results indicated that both measures may be suitable for assessing tic severity and the consequences of tics in these countries. No differences in parent-reported tic severity were found. However, parents of children with TD from the United Kingdom reported significantly more reactions to their child's tics than parents from the United States and Netherlands/Norway.

ARTICLE HISTORY
Received 28 July 2020
Revised 10 November 2020
Accepted 25 November 2020

KEYWORDS
Cross-cultural; reactions to tics; tic severity; Tourette's disorder

Introduction

Persistent tic disorders (PTDs) are childhood-onset neurological conditions characterized by sudden, repetitive, nonrhythmic motor movements and/or vocalizations that persist for at least one year (American Psychiatric Association, 2013). These disorders, which include persistent motor or vocal tic disorders and Tourette's disorder (TD), occur in about 0.8% to 1.9% of youth and are more prevalent in boys (Knight et al., 2012; Robertson, 2015; Robertson et al., 2017; Scharf et al., 2012). Studies across countries suggest that age of tic onset is about 6–7 years old (Freeman et al., 2000; Kraft et al., 2012; Leckman et al., 1998; Mathews et al., 2001).

Despite several studies examining cultural differences in clinical characteristics of TD (Freeman et al., 2000; Kraft et al., 2012; Robertson, 2008; Scahill et al., 2014), few have specifically investigated tic severity. Eapen and Robertson (2008) demonstrated that participants from the United

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Kingdom had greater tic severity scores than those from the United Arab Emirates, but possible selection biases (United Kingdom respondents were from a specialized clinic; United Arab Emirates participants were from general psychiatry clinics) provide a confound that precludes a conclusion that cultural factors were responsible for the differences. Further, Samar et al. (2013) found no differences in tic severity scores between children with TD from New York vs. Buenos Aires, and Mathews et al. (2001) found that tic severity scores for 85 children in Costa Rica were similar to tic severity scores found in United States samples. Combined, these limited data indicate few differences in tic severity across cultures.

Although tics are neurologically based, the environment plays a significant role in their expression. Environmental factors found to reliably impact tic expression, primarily from research conducted in United States samples, can be broken down into antecedents and consequences. Antecedents are external or internal events that occur immediately before tics that change the likelihood of tic occurrence (Conelea & Woods, 2008). Examples of external antecedents include various settings (e.g., school, home, friend's house), activities (e.g., sports, music), and specific stimuli (e.g., specific person, temperature; Conelea & Woods, 2008). Examples of internal antecedents include the premonitory urge or emotional states such as anxiety or boredom (Eapen et al., 1994). Consequence variables occur after tics and serve to maintain or strengthen the future probability of tics via positive or negative reinforcement (Conelea & Woods, 2008). Examples of external consequences include consoling, teasing, or allowing a child to stop doing an unpleasant activity after he/she tics, whereas an example of an internal consequence involves the reduction of the aversive premonitory urge that occurs as a tic is completed (Himle et al., 2007; Woods et al., 2005).

Research conducted primarily in the United States has shown the impact of consequence variables on tic severity, and several studies have demonstrated situations in which consequence variables positively or negatively reinforce tic expression (Capriotti et al., 2015; Eaton et al., 2017; Himle et al., 2014; Packer, 2005; Watson & Sterling, 1998; Zinner et al., 2012). For instance, Capriotti et al. (2015) used the Tic Accommodation and Reactions Scale (TARS) and Parent Tic Questionnaire (PTQ) to examine the relationship between reactions to tics and tic severity. Results demonstrated that aversive (e.g., one child teases another child), attention (e.g., parent gives child a hug), and escape-based (e.g., child allowed to stop doing homework) reactions to tics were positively correlated with several dimensions of tic severity. Similar results were found by Eaton et al. (2017), and a study by Himle et al. (2014) showed that child and parent-reported social reactions to tics were positively correlated with increased tic

frequency. Furthermore, Himle et al. showed that in situations where tic exacerbation occurred, children were more likely to have reported being asked to leave a room or not being required to complete a chore or task because of tics.

Few studies have examined how individuals outside the United States react to tics, and there has not been a consistent assessment tool used in these studies. Debes et al. (2010) assessed psychosocial and educational consequences of TD in 314 children from Denmark and found that approximately 45% of children were teased in school due to TD. In contrast, among 85 Costa Rican subjects, only 13% acknowledged negative reactions to tics, such as teasing from peers or scolding by parents (Mathews et al., 2001). The authors suggested that in Costa Rica, motor and vocal tics may be viewed as bad habits (e.g., nail biting); therefore, associated with less stigma. In a qualitative study of Spanish health professionals, children with TD, and parents, results showed that parents reported several reactions to tics, which the children felt made their tics worse (Rivera-Navarro et al., 2014). Such reactions included telling the child to stop ticcing, helping the child hide tics, and constantly acknowledging tics. Combined, these studies suggest that the frequency and type of reactions to tics may differ among countries; however, these studies only examined participants from three different countries and did not utilize a standardized measure.

Because little evidence exists to predict how individuals outside of the United States may react to tics, understanding cross-cultural differences in stigma toward TD and similar neurological disorders could provide insights into how individuals from various cultures may react differently to tics. Persons living in countries where tics and similar conditions are more heavily stigmatized may be more likely to react in ways (i.e., social disapproval) that could inadvertently reinforce tics.

For example, in a qualitative study, Cutler et al. (2009) found that children with TD in the United Kingdom struggled to fit into society's expectations of normal behavior, and felt that others viewed them as being "annoying" or "naughty" when ticcing. Similarly, Wadman et al. (2013) found that adolescents with TD in the United Kingdom reported having had others react negatively to their tics, and Katona (2013) found that 26% of respondents would not want their children to marry an individual with TD. In Israel, Ben-Ezra et al. (2017) demonstrated that viewing a video clip of someone with tics resulted in increased negative attitudes toward those with TD. Further, a series of studies in Australia suggest significant stigma associated with TD in this country. Grace and Russell (2005) found that Australian individuals with TD felt socially isolated at school and were excluded from activities. Likewise, O'Hare and colleagues found that (a)

Australian youth with TD experienced significant bullying and social rejection by peers (O'Hare et al., 2015), (b) TD was uniquely associated with impaired social functioning and peer relationship problems (O'Hare et al., 2016), (c) there was a direct association between increased tic severity and insecure attachment to peers and poor quality of life outcomes (O'Hare et al., 2016), and (d) 86% of mothers reported that they experienced significant social isolation due to their child's diagnosis of TD, possibly indicative of significant social stigma associated with the disorder (O'hare et al., 2017).

Several studies have also examined the stigmatization of other visible neurological disorders such as epilepsy and Parkinson's disease. Although different from tic disorders, such comparisons may indicate ways in which individuals from other countries could react to TD. For example, Baker et al. (2000) examined self-perceptions of stigma in over 5000 individuals with epilepsy from 15 European countries. Results showed that 51% of participants reported feeling stigmatized, with 18% reporting feeling highly stigmatized. Cross-cultural analyses demonstrated that individuals in Spain perceived the least stigma, whereas respondents in France felt the most. Further, Jacoby et al. (2004) demonstrated that participants from the United Kingdom seemed well-informed about epilepsy, and approximately 90% of respondents thought people with epilepsy could be as intelligent and successful as the general public. Unfortunately, close to half of the sample still believed that people with epilepsy are treated differently by society and that they may act unpredictably and out of control. Nijhof (1995) interviewed 24 individuals with Parkinson's disease in the Netherlands about ways they are perceived in public. A common response was that participants often felt other people constantly stared at and judged them for having movements outside the norm.

Combined, these studies demonstrate that negative perceptions of individuals with tics and similar neurological disorders are common in children, adolescents, and adults. Individuals with TD are stigmatized, as the public views people with tics as less socially acceptable than those without tics, and negative perceptions increase as a function of tic severity. Such negative perceptions of tics could lead individuals to react negatively to tics (e.g., teasing, telling someone to stop ticcing, or excluding someone from an activity) when they occur. Although the studies reviewed above do not give a clear direction on which countries may have more or less stigma toward tics than others, there was variability in stigma toward TD and similar neurological disorders. Such variability suggests that there may be meaningful differences in how individuals from various countries perceive and react to individuals with TD. Further research needs to be conducted

to directly compare reactions to tics across cultures using a standardized measure.

One possible measure is the TARS, a standardized self and parent-report instrument that evaluates the number and frequency of immediate consequences for tics (Capriotti et al., 2015). The TARS includes questions about various consequences of tics that may occur in various settings, and yields scores from each of three setting-based subscales (home, school, and public) and each of three different behavioral functions (attention, escape, and aversive). The TARS has demonstrated good internal consistency and acceptable convergent and divergent validity, but these psychometric properties have only been established in respondents from the United States (Capriotti et al., 2015).

As with reactions to tics, few studies have examined tic severity across cultures. The Parent Tic Questionnaire (PTQ) is a parent-report measure of tic severity that could be used to assess tic severity across different countries. The psychometric properties of the PTQ have been examined in two studies, with both demonstrating that the measure has acceptable internal consistency, temporal stability, convergent validity, and divergent validity (Chang et al., 2009; Ricketts et al., 2018). However, the PTQ has only been analyzed with individuals from the United States.

The current study had two aims. First, we examined a limited set of psychometric properties for the English-language versions of the Parent Tic Questionnaire (PTQ) and the Tic Accommodations and Reaction Scale—Parent Report (TARS-PR) with individuals from different countries of origin. It was hypothesized that the PTQ and TARS-PR would demonstrate acceptable or greater internal consistency and convergent validity across participants from the different countries. Second, in order to begin evaluating potential cross-cultural differences in reactions to tics and tic severity, we administered the TARS-PR and PTQ to individuals from three different international regions and conducted exploratory comparisons.

Method

Participants

Participants included parents of children with tic disorders from multiple countries. To be eligible, parents had to (a) be at least 18 years old, (b) serve as the parent or guardian of a child who met parent self-report criteria for TD or PTD, (c) live in the same household as the child, and (d) read English. Participants were recruited via multiple settings. The first group of participants were recruited at the 2018 National Education and Advocacy Conference hosted by the Tourette Association of America (TAA) in Arlington, Virginia. Participants also were recruited through

Table 1. Child demographics and clinical characteristics of select countries.

	Relative percentage (*n*/*N*)					
Variables	Overall ($N = 223$)	United States ($N = 76$)	United Kingdom ($N = 97$)	Netherlands/ Norway ($N = 50$)	Chi-square statistic (χ^2)	Significance level
Gender					1.70	0.59
Male	74.9 (167/223)	78.9 (60/76)	72.2 (70/97)	74 (37/50)		
Female	25.1 (56/223)	21.1 (16/76)	27.8 (27/97)	26 (13/50)		
Race						
White	84.8 (189/223)	88.2[a] (67/76)	85.6[a] (83/97)	78[a] (39/50)		
Non-White	15.2 (34/223)	11.8[a] (9/76)	14.4[a] (14/97)	22.0[a] (11/50)		
Lifetime medication for tics	41.7 (93/221)	57.9[a] (44/76)	37.5[b] (36/96)	26.5[b] (13/49)	13.49	<0.01
Lifetime behavior therapy for tics	31.4 (65/207)	31.9 (22/69)	26.7 (24/90)	39.6 (19/48)	2.44	0.30
Any comorbid diagnosis	67.6 (148/219)	77 (57/74)	63.5 (61/96)	61.2 (30/49)	4.63	0.10
Comorbid diagnoses (parent report)						
Obsessive-compulsive disorder	34.8 (77/221)	46.7[a] (35/75)	35.4[a] (34/96)	16[b] (8/50)	12.45	<0.01
Attention deficit hyperactivity disorder	40.6 (88/217)	52[a] (39/75)	25.8[b] (24/93)	51[a] (25/49)	14.69	<0.01
Anxiety disorder	45.5 (100/220)	58.1[a] (43/74)	50[a] (48/96)	18[b] (9/50)	20.78	<0.01
Eating disorder	4.6 (10/216)	1.3 (1/75)	6.5 (6/93)	6.3 (3/48)	2.83	0.24
Alcohol or drug abuse	0.5 (1/216)	1.3 (1/75)	0 (0/93)	0 (0/48)	1.89	0.39
Age, *M* (*SD*)	11.96 (3.45)	11.93 (3.63)	12.37 (3.17)	11.21 (3.62)		0.16
Tic age at onset, *M* (*SD*)	8.27 (3.01)	7.70[a] (2.83)	8.89[b] (3.22)	7.92[ab] (2.65)		0.02

Note. Chi-square tests were conducted to assess differences in gender, race, lifetime tic-medication, lifetime behavior therapy for tics, and lifetime comorbid diagnoses among children from the United States, United Kingdom, and Netherlands/Norway. A one-way analysis of variance (ANOVA) was conducted to examine differences in current age and age at onset among participants from the United States, United Kingdom, and Netherlands/Norway.

regular clinic flow at the Tic Disorder Specialty Clinic at Marquette University and via the TAA website and social media outlets (e.g., Facebook, Twitter, etc.). Finally, the online survey was sent via email to those who lead TD support groups and TD organizations in the United Kingdom, Norway, Australia, Austria, Lebanon, the Netherlands, and Israel. These individuals were asked to distribute the online survey to eligible participants.

Two hundred ninety-four participants from 25 countries completed the study; however, the data collected yielded an adequate sample size from only a few select countries. These samples included participants with a country of origin in (1) United States ($n = 76$), (2) United Kingdom ($n = 97$), and (3) Netherlands and Norway ($n = 50$; Tables 1 and 2). Participants from the Netherlands and Norway were combined because

Table 2. Parent/guardian demographics of select countries.

	Relative percentage (*n*/*N*)					
Variables	Overall ($N = 223$)	United States ($N = 76$)	United Kingdom ($N = 97$)	Netherlands/ Norway ($N = 50$)	Chi-square statistic (χ^2)	Significance level
Gender					9.96	<0.01
Male	6.4 (14/218)	4.1[ab] (3/74)	3.2[b] (3/94)	16[a] (8/50)		
Female	93.6 (204/218)	95.9[ab] (71/74)	96.8[b] (91/94)	84[a] (42/50)		
Relationship to Child					14.47	0.03
Mother	93.6 (204/218)	95.9[ab] (71/74)	96.8[b] (91/94)	84[a] (42/50)		
Father	5.5 (12/218)	2.7[ab] (2/74)	3.2[b] (3/94)	14[a] (7/50)		
Stepfather	<0.01 (1/218)	0[a] (0/74)	0[a] (0/94)	2[a] (1/50)		
Uncle	<0.01 (1/218)	1.4[a] (1/74)	0[a] (0/94)	0[a] (0/50)		
Race					4.20	0.13
White	89.2 (198/222)	93.4[a] (71/76)	89.6[a] (86/96)	82[a] (41/50)		
Non-White	10.8 (24/222)	6.6[a] (5/76)	10.4[a] (10/96)	18[a] (9/50)		
Single parent household	17 (38/223)	10.5[a] (8/76)	24.7[b] (24/97)	12[a] (6/50)	7.25	0.03
Education						
Eighth grade—no high school	.5 (1/220)	0 (0/76)	1.1 (1/94)	0 (0/50)		
High school diploma or equivalent (GED)	11.4 (25/220)	10.5 (8/76)	10.6 (10/94)	14.0 (7/50)		
Technical/trade school or some college	16.4 (36/220)	17.1 (13/76)	16.0 (15/94)	16.0 (8/50)		
Junior/Community college graduate (A.A.)	8.6 (19/220)	10.5 (8/76)	10.6 (10/94)	2.0 (1/50)		
College graduate or equivalent (B.A., B.S.)	38.6 (85/220)	38.2 (29/76)	39.4 (37/94)	38.0 (19/50)		
Postgraduate/ Professional degree (M.A., Ph.D., M.D., J.D.)	24.5 (54/220)	23.7 (18/76)	22.3 (21/94)	30.0 (15/50)		
Age, *M* (*SD*)	42.06 (6.57)	41.55[ab] (6.09)	43.33[a] (6.73)	40.46[b] (6.66)		0.03

Note. Chi-square tests were conducted to assess differences in gender, relationship to child, race, and single parent household among parents from the United States, United Kingdom, and Netherlands/Norway. A Mann–Whitney test was used to examine differences in education level among parents from the United States, United Kingdom, and Netherlands/Norway. There were no differences in education level among the three countries. A one-way analysis of variance (ANOVA) was conducted to examine differences in current age among parents from the United States, United Kingdom, and Netherlands/Norway.

both countries had fewer participants than the United States and United Kingdom, both countries are located in Northern Europe, and there were no significant demographic differences between the two countries.

Procedure

Participants were presented with an online or paper version of the project's Institutional Review Board (IRB)-approved Marquette University Research Information Sheet. After reading the information sheet, participants

completed a short screening questionnaire to determine study eligibility based on the study's inclusion/exclusion criteria. The online and paper questionnaires included a demographics form, the TARS-PR, the PTQ, and other parent report measures not examined in this study. The online questionnaire was a Qualtrics-based online survey.

Data from the National Education and Advocacy Conference in Arlington, Virginia ($n = 11$), were collected by the PI, who provided participants with a summary of the study before guiding them through the information sheet. Additionally, the PI answered participants' questions throughout the study and debriefed them at the end. During the online data collection, there was minimal interaction between the researcher and participants. Such interactions only occurred if participants emailed the PI to ask questions. The Qualtrics-based online survey was completed at the location of the participants' choosing and took approximately 30 min to complete. All procedures were approved by Marquette University's IRB. Participants did not receive monetary compensation for their participation.

Measures

Tic Accommodations and Reactions Scale—parent report

The TARS-PR (Capriotti et al., 2015) is a parent-report measure developed based on consequence items on the Functional Assessment Interview Form used in CBIT (Woods et al., 2008). Common reactions that occur in response to children's tics are categorized into three setting-based and three function-based subscales. For each question, parents use a 0–3 scale (not at all, a few times, several times, many times) to rate how often their child had experienced each immediate consequence to tics in the past week. The three setting-based subscales include home ($n = 14$ items; Range = 0–42), school ($n = 9$ items; Range = 0–27), and public ($n = 12$ items; Range = 0–36) domains. The three function-based subscales include attention ($n = 20$ items; Range = 0–60), escape ($n = 10$ items; Range = 0–30), and aversive ($n = 17$ items; Range = 0–51) domains. Table 3 shows sample items from the six subscales. In this study, TARS-PR total score (Range = 0–105) and each of the TARS-PR subscale scores were used as dependent variables. The TARS-PR has demonstrated good internal consistency and acceptable convergent and divergent validity, but these psychometric properties have not been examined across different ethnicities or outside of the United States.

Parent Tic Questionnaire

The PTQ (Chang et al., 2009) is a parent-report measure designed to assess for the presence, frequency, and intensity of motor and vocal tics. It

Table 3. TARS-PR sample items.

TARS-PR subscale	Sample items
School	He/she cannot fully complete schoolwork
	He/she cannot participate fully in a fun school activity
	He/she has to leave school for the day
Home	He/she has to stop playing a videogame or watching TV
	He/she is left out of family activities
	A parent tells him/her to stop ticcing
Other	An adult other than a relative tells him/her to stop ticcing
	He/she has to stop playing a sport or outdoor game
	He/she is asked to leave a public place
Attention	A parent verbally comforts him/her
	Another kid asks if he/she is ok
	An adult asks him/her questions about tics
Aversive	Another kid teases him/her
	An adult laughs at him/her
	He/she is left out of family activities
Escape	A parent or sibling completes a chore or task for him/her
	He/she does not go to school at all for the day
	He/she does not complete homework

Note. Sample items from each subscale of the Tic Accommodations and Reactions Scale—Parent Report (TARS-PR).

contains separate lists of 14 common motor and 14 common vocal tics. For each tic endorsed, parents indicate the frequency and intensity of that tic. For frequency, ratings are made on a 1–4 scale anchored by the descriptions "constantly" (almost all the time during the day), "hourly" (at least once per hour), "daily" (at least several times a day), or "weekly" (just a few times or less). Intensity ratings are also made on a 1–4 scale, with 1 being a very mild, weak tic and 4 being a very forceful, noticeable tic that may even be painful. The motor tic severity score (Range = 0–112) and vocal tic severity score (Range = 0–112) are computed by summing the scores for motor and vocal tics, respectively. The total tic severity score (Range = 0–224), which is computed by adding the motor and vocal tic subscale scores, was used as a dependent variable in this study. The PTQ has demonstrated good internal consistency, temporal stability, convergent validity, and discriminant validity; however, these psychometric properties have not been examined across different ethnicities or outside of the United States (Chang et al., 2009; Ricketts et al., 2018).

Results

Psychometric properties of TARS-PR and PTQ

Cronbach's alpha coefficients were calculated to evaluate the internal consistency of the TARS-PR in the United States, United Kingdom, and Netherlands/Norway (Table 4). In all three countries, internal consistency was excellent for the TARS-PR total score and good for the Home subscale score. For the school and public subscales, internal consistency was excellent in the United Kingdom ($\alpha = 0.90$; $\alpha = 0.91$), and good in the United States ($\alpha = 0.87$; $\alpha = 0.83$) and

Table 4. Differences in reactions to tics—overall TARS.

TARS-PR	All countries, mean (*SD*)	United States, mean (*SD*)	United Kingdom, mean (*SD*)	Netherlands/ Norway, mean (*SD*)	Significance level
TARS total (35 items; Range = 0–105)	19.55 (16.53) ($\alpha = 0.94$)	16.13[a] (12.55) ($\alpha = 0.91$)	24.00[b] (19.56) ($\alpha = 0.95$)	16.40[a] (13.77) ($\alpha = 0.92$)	<0.01
School total (9 items; Range = 0–27)	5.46 (5.86) ($\alpha = 0.89$)	4.44[a] (5.24) ($\alpha = 0.87$)	7.00[b] (6.68) ($\alpha = 0.90$)	4.16[a] (4.40) ($\alpha = 0.83$)	<0.01
Home total (14 items; Range = 0–42)	9.06 (6.95) ($\alpha = 0.84$)	7.95[a] (5.75) ($\alpha = 0.81$)	10.48[b] (7.96) ($\alpha = 0.86$)	8.05[ab] (6.18) ($\alpha = 0.81$)	<0.05
Other total (12 items; Range = 0–36)	5.04 (5.70) ($\alpha = 0.89$)	3.77[a] (4.08) ($\alpha = 0.83$)	6.56[b] (6.91) ($\alpha = 0.91$)	4.18[a] (4.75) ($\alpha = 0.85$)	<0.01
Attention total (20 items; Range = 0–60)	10.90 (9.35) ($\alpha = 0.91$)	9.19[a] (7.46) ($\alpha = 0.86$)	13.31[b] (10.77) ($\alpha = 0.92$)	9.00[a] (8.19) ($\alpha = 0.90$)	<0.01
Aversive total (17 items; Range = 0–51)	8.25 (8.29) ($\alpha = 0.89$)	6.27[a] (5.80) ($\alpha = 0.82$)	10.42[b] (10.19) ($\alpha = 0.92$)	7.16[ab] (6.54) ($\alpha = 0.83$)	<0.01
Escape total (10 items; Range = 0–30)	6.00 (5.82) ($\alpha = 0.85$)	5.19[a] (4.58) ($\alpha = 0.78$)	7.15[b] (6.77) ($\alpha = 0.87$)	5.07[ab] (5.32) ($\alpha = 0.87$)	0.01

Note. The statistics presented in this table correspond with one-way ANCOVA tests using tic medication status as the covariate to determine differences in common reactions that occur in response to children's tics among participants with different countries of origin. The mean is calculated by averaging the total score of each subscale. Cronbach's alpha coefficients were also calculated to evaluate the internal consistency of the TARS-PR in the United States, United Kingdom, and Netherlands/Norway.

TARS-PR: Tic Accommodations and Reactions Scale—Parent Report.

Netherlands/Norway ($\alpha = 0.83$; $\alpha = 0.85$). Cronbach's alpha coefficients were also calculated in each country for the function-based subscales. For the attention and aversive subscales, internal consistency was excellent in the United Kingdom ($\alpha = 0.92$; $\alpha = 0.92$) and good in the United States ($\alpha = 0.86$; $\alpha = 0.82$). In the Netherlands/Norway, internal consistency was excellent for the attention subscale ($\alpha = 0.90$) and good for the aversive subscale ($\alpha = 0.83$). Internal consistency was also good for the escape subscale in the United Kingdom ($\alpha = 0.87$) and Netherlands/Norway ($\alpha = 0.87$) and acceptable in the United States ($\alpha = 0.78$).

For the PTQ total tic severity score, Cronbach's alpha coefficients showed excellent internal consistency in the United Kingdom ($\alpha = 0.92$) and good internal consistency in the United States ($\alpha = 0.85$) and Netherlands/Norway ($\alpha = 0.89$; Table 5). For PTQ motor and vocal tic severity scores, good internal consistency was shown in the United Kingdom ($\alpha = 0.86$; $\alpha = 0.89$) and Netherlands/Norway ($\alpha = 0.85$; $\alpha = 0.85$). In the United States, internal consistency for the PTQ motor tic severity score was good ($\alpha = 0.80$), while acceptable internal consistency was shown for the PTQ vocal tic severity score ($\alpha = 0.77$; Table 5).

Table 5. PTQ internal consistency.

	All countries	United States	United Kingdom	Netherlands/Norway
Motor tic score	$\alpha = 0.84$	$\alpha = 0.80$	$\alpha = 0.86$	$\alpha = 0.85$
Vocal tic score	$\alpha = 0.85$	$\alpha = 0.77$	$\alpha = 0.89$	$\alpha = 0.85$
Total score	$\alpha = 0.89$	$\alpha = 0.85$	$\alpha = 0.92$	$\alpha = 0.89$

Note. Cronbach's alpha coefficients were calculated to evaluate the internal consistency of the PTQ in the United States, United Kingdom, and Netherlands/Norway.
PTQ: Parent Tic Questionnaire.

Table 6. Correlations between TARS-PR and PTQ.

	PTQ total score	PTQ motor tic score	PTQ vocal tic score
United States TARS total	0.42**	0.32**	0.39**
United Kingdom TARS total	0.56**	0.52**	0.52**
Netherlands/Norway TARS total	0.71**	0.64**	0.55**

Note. Spearman rho correlation coefficients were completed between TARS-PR and PTQ scores in the respective countries.
TARS-PR: Tic Accommodation and Reactions Scale—parent report; PTQ: Parent Tic Questionnaire.
*$p < 0.05$. **Bonferroni Correction: $p < 0.02$.

To evaluate the convergent validity of the TARS-PR, TARS-PR scores were correlated with PTQ scores. Spearman rho correlation coefficients demonstrated that in all three groups of countries, PTQ total score was significantly positively correlated with TARS-PR total score after a Bonferroni correction (Table 6). Further, in the United States, United Kingdom, and Netherlands/Norway, TARS-PR total score was also significantly positively correlated with PTQ motor and vocal tic severity scores after a Bonferroni correction.

Reactions to children's tics

Common reactions to tics, as measured by the TARS-PR total score, were explored among participants with different countries of origin (i.e., (1) United States, (2) United Kingdom, and (3) Netherlands/Norway). Because tic medication decreases tics, it is possible that individuals taking medication may report fewer reactions to tics on the TARS (Scahill et al., 2006). This notion, combined with the finding that tic medication status differed among the three groups of countries (χ^2 (2, $N = 221$) = 13.49, $p < 0.01$), led us to use tic medication status as a covariate in the one-way analysis of covariance (ANCOVA) used to examine cross-country differences in TARS-PR total scores. There were no differences in lifetime behavior therapy for tics or lifetime comorbid diagnoses of the children among the three groups of countries; therefore, these factors were not used as covariates (Table 1). Results demonstrated a significant effect of country of origin on reactions to tics, $F(2, 179) = 6.93$, $p < 0.01$, partial $\eta^2 = 0.07$ (Table 4). Pairwise comparisons indicated that parents of children with TD from the United Kingdom reported significantly more reactions to tics than individuals from the United States and Netherlands/Norway. Further, when

school ($F(2, 179) = 6.56$, $p < 0.01$, partial $\eta^2 = 0.07$), public places ($F(2, 184) = 6.04$, $p < 0.01$, partial $\eta^2 = 0.06$), and attention ($F(2, 179) = 5.40$, $p < 0.01$, partial $\eta^2 = 0.06$) subscales of the TARS-PR were examined separately, results showed a significant effect of country of origin after controlling for tic-reducing medication (Table 4). Parents of children with TD from the United Kingdom reported that individuals reacted significantly more to their child's tics on all three subscales than participants from the United States and Netherlands/Norway.

Results were slightly different for the remaining subscales. When home ($F(2, 185) = 4.63$, $p = 0.01$, partial $\eta^2 = 0.05$), aversive ($F(2, 179) = 6.75$, $p < 0.01$, partial $\eta^2 = 0.07$), and escape-based ($F(2, 179) = 4.38$, $p = 0.01$, partial $\eta^2 = 0.05$) subscales of the TARS-PR were examined separately, results still showed a significant effect of country of origin after controlling for tic reducing medication. However, for these subscales of the TARS-PR, parents of children with TD from the United Kingdom only reported significantly more reactions to their child's tics than participants from the United States, not participants from the Netherlands/Norway (Table 4).

Tic severity

Potential differences in tic severity, as measured by parent reported PTQ total score, were explored among individuals from different countries of origin. As previously mentioned, the three groups differed in participant tic medication status. Thus, a one-way ANCOVA examining potential differences in tic severity, as measured by PTQ total score, was conducted using lifetime tic medication status as the covariate. Results showed no significant effect of country of origin on tic severity, $F(2, 140) = 1.60$, $p = 0.21$, partial $\eta^2 = 0.02$.

Discussion

Although tic disorders have a neurological basis, contextual factors play a significant role in the variability of their expression. Studies have demonstrated that consequences for ticcing can alter tic severity via positive and negative reinforcement (Conelea & Woods, 2008). Unfortunately, few studies have examined how individuals outside the United States react to tics. In the current study, after examining cross cultural psychometric properties of the PTQ and TARS-PR, potential cross-cultural differences in levels of tic severity and common reactions to children's tics were explored.

Psychometric properties of TARS-PR and PTQ

Both the TARS-PR and PTQ demonstrated strong internal consistency and high convergent validity in participants from the United States, United

Kingdom, and Netherlands/Norway. Past research has only examined psychometric properties of the TARS-PR and PTQ in individuals from the United States (Capriotti et al., 2015; Chang et al., 2009; Ricketts et al., 2018). This study suggests that the two measures may also be suitable for examining consequences of tics and tic severity in the United Kingdom and Netherlands/Norway. However, additional research should be completed to further examine the psychometric properties of the measures in these countries and to determine whether the properties of the instrument are maintained when translated into these countries' native languages (e.g., in the case of the Netherlands and Norway).

Reactions to children's tics

This study also examined common reactions to children's tics in the United States, United Kingdom, and Netherlands/Norway. Parents of children with TD from the United Kingdom reported significantly more reactions to tics than participants from the United States and Netherlands/Norway. These results are partially consistent with studies examining the stigmatization of individuals with TD from the United Kingdom. Cutler et al. (2009) indicated that individuals in the United Kingdom may have negative attitudes toward tics because they view the movements as intentional and controllable. Thus, the movements being perceived as socially inappropriate may lead to tic-contingent reactions. Further, Wadman et al. (2013) reported that participants with TD from the United Kingdom were hesitant to talk with unfamiliar peers because of past social disapproval and negative interactions. Therefore, stigmatizing attitudes related to TD in the United Kingdom may be associated with greater reactions to tics.

Likewise, how individuals from the United Kingdom have been found to interact with people with epilepsy, another neurological disorder, may also provide clues to understand this finding. Jacoby et al. (2004) demonstrated that over half of the 1694 respondents from the United Kingdom believed that individuals with epilepsy may act unpredictably and out of control, and that society treats them differently from people without the condition. Further, when Baker et al. (2000) examined the perceived stigma of individuals with epilepsy from the United Kingdom and the Netherlands, results indicated that 52% of the individuals with epilepsy from the United Kingdom felt stigmatized compared to 40% of the individuals from the Netherlands. If other visible neurological disorders, such as TD, engender similar stigmatization in the United Kingdom, then it may be expected that participants from the United Kingdom would report more reactions to their child's tics than participants from the United States or Netherlands/Norway.

Providing more context to differences on the overall TARS-PR score, analyses of the TARS-PR subscale scores showed that parents from the United Kingdom reported significantly more reactions in school and public places compared to parents from the United States and Netherlands/Norway. Given the more negative perception of persons with epilepsy in the United Kingdom and research showing that teachers' attitudes toward children with epilepsy in the United States were generally supportive and understanding (Bishop & Boag, 2006), it is possible that persons in the United Kingdom, particularly in school environments, could receive more negative reactions to movement-related conditions in general, relative to those in the United States.

Yet another possible explanation for more reactions to tics in the United Kingdom may reflect cross-country differences in how those with mental disorders are perceived. Indeed, multiple studies demonstrated differences in stigmatizing attitudes toward mental illness across countries (Chambers et al., 2010; Dietrich et al., 2004; Griffiths et al., 2006; Stefanovics et al., 2016), and Mehta et al. (2009) found that those in England expressed fewer positive responses toward mentally ill individuals than those from Scotland. These data suggest that broad stigmatization toward those with mental illness may relate to increased stigma toward individuals with tics, which in turn, could increase reactions to tics.

Tic severity

Potential differences in tic severity were explored among participants from the United States, United Kingdom, and Netherlands/Norway. Consistent with findings from other studies (Freeman et al., 2000; Mathews et al., 2001; Samar et al., 2013), results demonstrated no differences in tic severity scores among the three groups. Still, one inconsistency emerged from these findings. Because parents from the United Kingdom reported significantly more reactions to their children's tics than parents from the United States and Netherlands/Norway, behavioral theory would predict that those in the United Kingdom would report greater tic severity. The failure to find such a relationship is problematic but may be explained by a measurement limitation of the TARS. Specifically, while the TARS measures the frequency with which reactions to tics occur, it does not measure other dimensions of the reactions that could influence the relationship between reactions to tics and tic severity. For example, parents could yell at their child to stop ticcing or discreetly ask the child to stop doing tics. In both cases, the reaction may be rated as occurring frequently on the aversive subscale, but they are qualitatively different as they may differently impact tic occurrence. Future research should be completed to discover what types of reactions may be

functioning as more or less powerful reinforcers. Further, other contextual factors not accounted for in this study may have influenced the tic severity of participants.

Limitations

The current study had several limitations. First, although these results were some of the first to compare reactions to tics among these countries, the sample size was relatively small. As such, the work should be viewed as an exercise in hypothesis generation rather than a definitive study on cross-cultural reactions to tics. Second, like other studies, most participants were white mothers, thus limiting a broad analysis across racial groups. Third, the study only utilized parent-report data of the child's tic severity and reactions to tics. This is potentially limiting given that Capriotti et al. (2015) found different TARS profiles depending on whether the reports came from the parent or the child. It would be beneficial to examine children's perspectives of these factors in future research.

Fourth, most participants were recruited online from TD support groups and through contacts with TD organizations in their country of origin. This recruitment strategy may limit the generalizability of the findings because these individuals may have more knowledge about and support for TD than most families who have a child with tics. Further, almost two-thirds of the participants had a college or advanced college degree, which is not representative of the general population. This may have influenced parent-reported reactions to tics across the countries. Therefore, a replication of this study with more diverse populations is needed. Finally, only the parents' country of origin was used to group the participants. Some parents could have been born in one country but lived most of their lives in a different country with their child. Likewise, by focusing only on the country of origin, the study is undoubtedly collapsing across other cultural factors that may also be important in understanding tic severity and reactions to tics.

Implications

This study indicated that the English versions of the TARS-PR and PTQ may be used to examine consequences of tics and tic severity, respectively, in the United States, United Kingdom, and Netherlands/Norway. Given that parents from the United Kingdom reported significantly more reactions to their child's tics than parents from the United States and Netherlands/Norway, it suggests that therapists may need to spend more therapeutic effort addressing contextual factors with clients from the

United Kingdom. For instance, parent-only sessions emphasizing the importance of and teaching parents specific skills to create a tic neutral environment could be particularly helpful in families from the United Kingdom.

Additionally, because children in Britain may be more likely to be asked about or teased because of their tics, it could be useful for clients to spend more time in session practicing an explanation for tics and their uncontrollable nature that can be given to others, including teachers and school-aged peers. Multiple studies have demonstrated that self-disclosure and peer education about TD is linked to less stigmatization, which could lead to fewer reactions to tics (Marcks et al., 2007; Nussey et al., 2014; Olufs et al., 2013; Woods, 2002; Woods et al., 2003). Having less stigma related to the condition potentially could reduce the number of consequences the clients receive.

Overall, this study indicated that unlike various clinical characteristics associated with tics, differences in reactions to tics occur across countries. Future research should focus on broadening these findings to more countries and examining if different ethnic groups within the same country vary in their reactions to tics. It would also be beneficial to obtain children's perspectives on how others react to their tics, because their perspectives may differ from their parents.

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