SIBLING RELATIONSHIPS AND FAMILY DYNAMICS IN FAMILIES WITH A CHILD WITH TOURETTE SYNDROME

by

Marjan Maleki-Tehrani

A thesis

presented to the University of Waterloo

in fulfillment of the

thesis requirement for the degree of

Doctor of Philosophy

in

Psychology

Waterloo, Ontario, Canada, 2006

AUTHOR'S DECLARATION FOR ELECTRONIC SUBMISSION OF A THESIS

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public

SIBLING RELATIONSHIPS AND FAMILY DYNAMICS IN FAMILIES WITH A CHILD WITH TOURETTE SYNDROME

Abstract

This study investigated the association between the severity of Tourette Syndrome (TS) and comorbid tendencies (Attention Deficit Hyperactivity Disorder (ADHD), Obsessive-Compulsive Disorder (OCD), and rage), maternal differential treatment, fairness evaluation of maternal differential treatment, and communication with both sibling and family relationships. Fifty-five mothers and healthy siblings of individuals with Tourette Syndrome participated in the study. The parents provided information regarding family demographics and the severity of Tourette Syndrome and comorbid tendencies, and the healthy siblings completed the sibling and family relationship questionnaires. The questionnaires were posted on a secure website, where the parents and healthy siblings could complete the online measures via internet connections.

The study revealed several important findings. The results showed significant associations between the severity of Tourette Syndrome and comorbid OCD, ADHD and rage tendencies thus suggesting that studying Tourette Syndrome without considering comorbidity would be unrealistic. Additionally, communication regarding Tourette Syndrome between the healthy siblings and their parents played an important role with respect to sibling and family relationships. Communication between the healthy siblings and their parents predicted more warmth between the healthy siblings and their sibling with Tourette Syndrome as well as more family cohesion and adaptability as reported by the healthy siblings. Communication had a significant moderating effect on both severity of Tourette Syndrome and healthy siblings' fairness evaluation of maternal differential treatment in predicting family relationships. When the

sibling had less severe Tourette Syndrome, the healthy siblings reported more family adaptability when they had more communication with their parents, and reported less family adaptability when they had less communication with their parents. The results also indicated that when healthy siblings perceived their maternal differential treatment to be unfair, they reported more family cohesion when they had more communication with their parents, and reported less family cohesion when they had less communication with their parents. The study did not support the negative impact of maternal differential treatment on sibling relationships; however, the results confirmed the previous findings regarding the moderating effect of fairness evaluation on maternal differential treatment in predicting sibling relationships. When the sibling with Tourette Syndrome was favored, the healthy siblings reported more sibling warmth when they perceived the favouritism (maternal differential treatment) to be fair. Furthermore, the results showed that healthy siblings' perceptions of maternal differential treatment could predict cohesion and adaptability in the family. The more the healthy siblings reported being treated differently by their mothers, the less cohesion and adaptability they reported in their families.

The present study supported previous studies in finding that sibling conflict decreased with age. The results also highlighted the role of age in moderating the effects of communication and maternal differential treatment in predicting sibling conflict. When healthy siblings had more communication with their parents they reported more conflict with their sibling with Tourette Syndrome when they were younger, and reported less sibling conflict with their sibling with Tourette Syndrome when they were older. Furthermore, when healthy siblings were favored by their mothers, they reported more conflict with their sibling with Tourette Syndrome when they were younger than when they were older, thereby emphasizing the importance of developmental differences in dynamics between the siblings.

The significant contributions of the study include underlining the importance of communication, the relationship between Tourette Syndrome and comorbid conditions, and healthy siblings' perceptions of sibling and family relationships.

Acknowledgments

I would like to thank my supervisor, Dr. Hildy Ross, for her invaluable supervision during my graduate study. Her academic, financial and emotional support has been priceless. With her patience, optimism and professionalism she has guided me through difficult times during the last six years. With her knowledge, wisdom and actions she has been a remarkable mentor and role model. There are no words to describe the magnitude of my gratitude for the exceptional opportunity that she provided me. Knowing her and working with her has been a great blessing in my life. Being alone and as a newcomer, often times I have felt like an unwanted "Ugly Duckling"; however, her unconditional support and welcoming attitude has always soothed my despair and nostalgia. I will forever cherish her memories and teachings, and will always remain grateful for the opportunity to be her apprentice. I have learnt immensely from her, and I will be indebted to her as long as I live, as taught by the saying, "Teach me a word, and I will be your servant forever."

I would like to thank Dr. Erik Woody for taking me through the wonderland of statistics and letting me enjoy my journey with unforgettable memories. It was an exceptional opportunity to have his invaluable guidance during my Ph.D. which he generously offered at any point of time. I would like to thank him for his invaluable advice, constructive feedback, and continuous support during the past three years.

I would like to thank Dr. Jeremy Anglin for accepting to be on my committee once again, for his invaluable comments and suggestions on my thesis, and during my academic life in the past six years. I am grateful to him for the great lessons that he has taught me.

I would like to thank the Tourette Syndrome Foundation of Canada, especially Ms. Rosie Wartecker for her continuous and unconditional support of the study, Michael Trink for his amazing job in designing the websites, and Vanessa Nicholas for her reliability coding. Thanks to Dr. Duncan McKinlay, Dr. Leslie Packer, Lauren Chance, Bethany Wagler, Olivia Ng, Dessy Marinova, Victoria Mok, Myra O'Seasnain, Crystal Van Dyk, Claudia Gosav, Sara Schlein, Kristi Baerg and all the families, parents and siblings that generously participated in the study. Thanks to my twin brother Ardavan for his vision seven years ago, for vigorously encouraging me to take my GRE and apply to UW, to my dear cousins Maryam & Rosie for their love and encouragement, and to my little sister Yasaman for her innocent and strong faith in her older sister's success against all odds.

Last but not least thanks to Leni and Emil Koehler, Ali Tehrani, Naghmeh Hejri, Wendy Vaughan, Beth Bowers, Vahid Miraftab, Maryam Alagheband and Peter Lang. They literally saved my life during the past six years and made my graduation possible.

Dedication

I dedicate this thesis to my spiritual mentors:

My beloved and late grandmother Ghamar Sadlaki (Tamaddon) and to my precious mother Touran Tamaddon (Maleki) who has patiently and constantly encouraged me during my lifetime, who has suffered, sacrificed, and endured overwhelming hardships with grace just to see me flourish. Their lifelong lessons of hope, optimism, unconditional love and everlasting forgiveness made it possible for me to survive the adversities in my life especially in the past six years.

To my extended family and friends who have touched my life and made this day possible.

Table of Contents

List of Tables

List of Figures

Sibling Relationships: An Overview

Siblings spend much of their lives together, especially during their early years. This ongoing and close interaction has its alternate states of alliance, collaboration, harmony, loyalty, companionship, and love versus competition, contention, rivalry, envy and jealousy (McKeever, 1983). The sibling relationship is also considered to be an important antecedent to peer and later adult relationships (Lobato, Faust & Spirito, 1988).

Children can affect their family, and this could have major implications for their siblings, especially when children have special mental and physical challenges. The sibling relationship in children with a chronically ill sibling is expected to be especially difficult. It has been suggested that the presence of a chronically ill child in a family could be a "demanding, emotionally draining and highly stressful experience" for the sibling and the family (Lavigne & Ryan, 1979, p. 616).

Loman (2000) reviewed the results of early investigations of the effects of an ill sibling on his/her healthy sibling. These included poor school performance, depression, separation anxiety, and headaches in the healthy siblings. However, these earlier investigations not only provided inconsistent findings, some reporting positive outcomes and the others reporting negative ones (Breslau, Weitzman & Messenger, 1981; Faux, 1991; Sahler et al., 1994), but also were mainly anecdotal, or had major methodological problems. The methodological problems included small sample sizes, lack of control groups, studying parents' assessments instead of those of the siblings themselves, and generally ignoring the reciprocal nature of the sibling relationship as well as illness-related factors such as the severity and chronicity of the illness (Breslau, Weitzman & Messenger, 1981; McKeever, 1983).

Recent studies on sibling relationships in families with chronically ill children have largely concerned children with physical disorders and illnesses such as cancer, cardiac disease, congenital disabilities, diabetes, and Spina Bifida (Williams, 1997). There have been few studies on the sibling relationships of children with psychological disorders such as mental retardation, Attention Deficit Hyperactivity Disorder, and Tourette Syndrome.

The goal of the present study was to investigate the family dynamics in families with a child with Tourette Syndrome, including sibling relationships and parent-child relationships. Tourette Syndrome (TS) is a neuropsychiatric disorder which is often comorbid with other psychiatric disorders such as Attention Deficit Hyperactivity Disorder and Obsessive-Compulsive Disorder. The present study examines the relationship between the severity of Tourette Syndrome and comorbid tendencies with parental differential treatment and sibling and family relationships. The present study predicts that the more severe the Tourette Syndrome and its comorbid tendencies, the more likely it is that parents feel compelled to pay attention and spend time with their child with Tourette Syndrome. This would result in parents treating their children differently, which is generally associated with poor relationships between siblings (Brody, Stoneman & Burke, 1987; Boll, Filipp & Ferring, 2003). However, it is also expected that effective communication regarding sibling's Tourette Syndrome between the parents and the healthy sibling would mitigate the likely negative impact of parental differential treatment. Therefore, it is predicted that healthy siblings who have constructive communication regarding their sibling's Tourette Syndrome with their parents are more likely to perceive their parents' differential treatment as fair and evaluate it as a justified behavior.

In the following sections the results of research on family dynamics (relationships between the siblings and between the children and their parents) in ordinary families and families

with a disabled sibling will be reviewed. Subsequently, research on family dynamics in families with Tourette Syndrome will be discussed.

Family Relationships in Ordinary Families

Family relationships consist of interactions between the siblings, the parents, and the parents and their children in an organized system. The present study concerns relationships between the siblings, and the siblings with their parents.

Sibling Relationships

Sibling relationships can be calm, amicable, and harmonious. Nevertheless, siblings can occasionally engage in aggressive, hostile, and antagonistic behaviors. Ross, Filyer, Lollis, Perlman and Martin (1994) reported 6.4 conflicts per hour between siblings in their observational study of preschool children in their homes. However, not all conflicts are negative. Conflicts can be positive and constructive with less negative effect. Age of the siblings is an influential factor in determining the extent to which siblings engage in conflicts. Frequency of conflicts decreases as the children grow older (Vandell & Bailey, 1992; Ross et al., 1996; McGuire, Manke, Eftekhari & Dunn, 2000). This could be the result of the maturity of the older siblings and their reluctance to engage in conflicts with their younger siblings. Sibling roles are also affected by their age. Sibling role relationships are more asymmetrical during early childhood, with older siblings being in the dominant roles. As siblings become older, their roles become more symmetrical (Brody & Stoneman, 1995).

Siblings' temperament is another factor influencing the sibling relationship. Brody, Stoneman and Burke (1987) reported that in both older and younger children, high activity, high emotional intensity and low persistence were associated with increased antagonistic behaviour

among sisters, and high activity and low persistence levels in younger brothers were associated with more antagonistic behaviour among brothers. Brody, Stoneman and Gauger (1996) reported that the quality of the sibling relationship was better when older siblings' temperaments were rated as easy rather than difficult. The same was not true for younger siblings' temperaments; a younger sibling with an easy temperament did not improve the quality of relationships with a difficult older sibling (Stoneman & Brody, 1993). They also reported that when older siblings' temperament was difficult, positive changes in the quality of parent-child relationships were associated with positive changes in the quality of sibling relationships. Therefore, they suggested that when parents are able to keep a positive relationship with the older child with a difficult temperament, this increases the chance for the parent-child relationship to operate as a protective factor and improves the effect of the difficult sibling on the sibling relationship. Stocker, Dunn and Plomin (1989) reported that older siblings' (5-to-10 years old) shyness was associated with less controlling and competitive sibling relationships, whereas younger siblings' (3-to-6 years old) anger and intensity of emotion were associated with more competitive sibling relationships.

Brody, Stoneman, McCoy and Forehand (1992) reported associations between family environment and sibling relationships. They studied same-gender sibling dyads and their parents. Maternal reports showed that higher adjustment and cohesion were associated with less sibling conflict at the time of the study and in longitudinal analyses, whereas paternal reports yielded the same associations but only for the longitudinal analyses.

Parent-Child Relationship and Differential Treatment

The sibling relationships are not independent of parent-child relationships. The two are interdependent elements of the family system. A prime example of the interdependence between parent-child and sibling relationships concerns parental differential treatment. Parental

differential treatment occurs if one child receives more parental affection while the other child is more often ignored or punished, or when one child receives more privileges than the other (Vandell & Bailey, 1992). Parents may consistently treat their two children differently, generally favouring one child over another, or children may perceive that their parents treat them and their siblings differentially (Kowal & Kramer, 1997; Hetherington, Reiss & Plomin 1994; Dunn & Plomin, 1990).

Ross et al. (1994) found that parents took sides with their children during the siblings' conflicts, and influenced the outcome of the conflicts with their partisanship. Although parents did not always side with one child or the other, children could be sensitive to the differential support that they or their siblings receive at any point in time. Thus, perceptions of parental differential treatment can arise when treatment is not relatively even-handed over time. Both differential treatment and perceptions of differential treatment are associated with negativity in the sibling relationships (Brody, Stoneman & McCoy, 1994; McGuire, Dunn, & Plomin, 1995; Kowal & Kramer, 1997; Boll, Filipp & Ferring, 2003). In a longitudinal study on sibling relationships, Brody et al. (1994) found a negative relationship between quality of sibling relationship and parental differential treatment. Boll, Filipp and Ferring's (2003) study of German subjects in their middle adulthood showed that the quality of the sibling relationship was most positive and least negative when both siblings were treated equally by their parents. The quality of the sibling relationship was most negative and least positive with perceived favoritism and disfavoritism for either sibling. Therefore, Boll and his colleagues suggested a curvilinear relationship between sibling relationship and parental differential treatment. Negative quality of sibling relationship had a U-shaped form, and positive quality of sibling relationship had an

inverse U-shaped form. However, Boll and his colleagues did not take age and gender into consideration.

Overall, past studies of parental differential treatment have demonstrated that showing more discipline and less warmth to one sibling relative to the other could be associated with increased behavioural problems and diminished self-esteem both during childhood and adolescence for the less favored child (McHale, Crouter, McGuire & Updegraff, 1995). Parental differential treatment could have a variety of outcomes. McGuire, Dunn & Plomin (1995) reported that children who received less affection and more discipline relative to their sibling showed more internalizing problems at the beginning of a longitudinal study. McGuire and her colleagues also suggested that since social comparison and fairness are important issues for children during middle childhood, children might react more negatively to parental differential treatment especially during these years. Differential treatment of siblings could extend long after children have left their parents' home and can still have a strong influence on the sibling relationship (Boll, Filipp & Ferring, 2003).

Like sibling conflict, parental differential treatment is not consistent over time. In a longitudinal study over a three year period, mothers reported significant variability in treating their children when they were 4.7 to 7.7 years of age and later when they were 7.9 to 10.5 years of age, regarding differential attention, differential affection, ease of discipline, and differential frequency of discipline (McGuire, Dunn & Plomin 1995). The same study showed that differential discipline had the highest stability and differential affection had the least stability.

Nevertheless, the consequences of parental differential treatment are not always negative. Kowal and Kramer (1997) have shown that children's attributions about the fairness and unfairness of parental differential treatment can moderate the outcome of parental differential

treatment, and the quality of the sibling relationship. Based on their study of 61 children aged 11 to 13 years-old, they suggested that children who identify their differences with their siblings are able to justify parental differential treatment. These children acknowledge that they are different from their siblings in age, needs, or relationship with their parents and therefore judge the parental differential treatment (due to these differences) to be fair rather than unfair. Older siblings who reported their parental differential treatment as fair reported higher levels of sibling warmth and closeness, and less sibling conflict, than those who reported parental differential treatment as being unfair. In a more recent study Boll, Filipp and Ferring (2005) reported that when children perceived themselves slightly favored, maternal and paternal differential treatment was perceived as fair. Maternal and paternal differential treatment was perceived as less fair or unfair when they perceived themselves as either not favored or extremely favored. Kowal and Kramer (2003) suggested that discussions in the family regarding parental differential treatment may provide children with explanations about parents' treatment and allow the children to appreciate, challenge, or accept their parents' differential treatment.

Overall, the past studies show that parents in general, but not consistently, treat their different children differently. A major factor in determining the impact of differential treatment is siblings' "judgement" or "justice evaluation" about its fairness or unfairness. When differential treatment is perceived as a justified behaviour, it could lead to less negative outcomes for sibling relationships, rather than when it is perceived to be unjustified, and discussions between the parents and their children may facilitate the children's judgement that parental differential treatment is fair.

The present study hypothesizes that parents with a child with Tourette Syndrome are likely to treat their healthy child and child with Tourette Syndrome differently. Parents'

resources, including time, attention and support are limited; they could be compelled to devote their resources unequally between their children due to stressful circumstances such as a chronic illness (Henderson, Hetherington, Mekos & Reiss, 1996). However, if the healthy children understand why they are being treated differently, and if they discuss their siblings' illness with their parents, they may perceive that their parental differential treatment is fair rather than unfair, in which case differential treatment should not be associated with more negative sibling relationships.

The next section reviews the literature on interactions among family members in families with a chronically ill child, and examines how different factors in these families could affect sibling relationships and parental behavior towards healthy and chronically ill siblings.

Families with a Chronically Ill Child

It is estimated that in the United States between four and seven million children have one or more chronic illness (Newacheck and Halfon cited by Sharpe and Rossiter, 2002). Childhood disease or disability could be considered a risk or stress factor (Lobato et al., 1988) that would not only affect disabled individuals, but also their families. Siblings, as well as the parents of chronically ill children, experience significant challenges (Meyer, 1993). In a study on families with congenitally impaired children, mothers reported that they assigned more protective responsibilities to their healthy child than they would have if they did not have the impaired child (Faux, 1991). Siblings of children with ADHD described their life as chaotic, conflictual, and exhausting (Kendall, 1999). They reported feeling victimized by the aggressive behaviors of their siblings, and manipulated by the intrusiveness of ADHD. Siblings of children with ADHD

reported that the aggressive behaviours of their siblings were not punished because the parents were too exhausted or overwhelmed to intervene (Kendall, 1999).

Studies have suggested that the healthy sibling's adjustment to their sibling's illness is associated with larger family size, greater age-spacing between the healthy and the ill sibling, the healthy sibling being younger than the ill sibling, the healthy and the ill sibling having the same gender, better socio-economic status of the family, and less severe illness (Simeonsson & McHale, 1981; Mckeever,1983; Pit-ten Cate & Loots, 2000). Sahler et al. (1994) also suggested that healthy siblings' adjustment to their sibling's illness is associated with the absence of parental depression, good marital adjustment, higher levels of neighbourhood/community social support, effective parent-sibling communication about the illness, and longer time since the diagnosis.

Among the factors suggested above, the present study investigates the association of sibling and family relationships with factors such as communication between the healthy sibling and the parents and the severity of the illness. One of the advantages of the present study over the previous studies is that it captures sibling and family relationships from the healthy siblings' point of view, rather than depending on parental reports.

Psychological Outcomes

Research findings on the psychological effects of having a chronically ill sibling have been inconsistent. Some studies have reported negative effects while others have suggested positive effects, or no effects.

In a study of sibling relationship in families with congenitally impaired children, Faux (1991) found a trend for healthy siblings of children with cardiac problems to be more kind, empathetic, and accepting of their siblings in comparison to healthy siblings of children with

craniofacial impairments, and a healthy control group. Mothers of siblings of the congenitally impaired children reported significantly less envy and jealousy between their children in comparison to the children in the healthy control group; however, the effects of severity and age were not considered in this study.

While some studies such as Faux's study indicated a number of positive outcomes, other studies have shown that having a disabled sibling does not necessarily have a positive effect on the well being of the healthy sibling; on the contrary, it could result in negative outcomes. Siblings of children with life threatening conditions, who had either been recently diagnosed or were doing poorly during the past year, felt more ignored by their parents and reported more sadness, in comparison with healthy children whose siblings had not been recently diagnosed and were doing fine during the past year (Stallard, Mastroyannopoulou, Lewis & Lenton, 1997). Parents of children with cancer reported adaptational problems and withdrawn behaviour in their previously well-adjusted healthy children (Carpenter & Sahler, 1991). Taylor, Fuggle and Charman (2001) reported that healthy siblings of children with chronic physical disorders scored in the borderline and abnormal range when mothers rated them on the Strengths and Difficulties Questionnaire (SDQ) for their adjustment. In a study of Canadian healthy siblings of chronically ill children, Cadman, Boyle and Offord (1988) reported a trend for increased emotional and internalizing disorders such as depression, anxiety, and obsessive-compulsive thoughts in the healthy siblings.

Sharpe and Rossiter (2002) carried out a meta-analysis of fifty published studies between 1976 and 2000 on the effects of chronic illness on siblings' well-being. The meta-analysis excluded case studies, non-empirical or qualitative studies, and studies without an appropriate comparison group or normative data. Sharpe and Rossiter (2002) found a statistically significant

and moderately negative overall effect as a result of having a sibling with a chronic illness. They found that parents' reports were more negative than the siblings' reports and that siblings of children with a chronic illness had lower psychological functioning, peer activity and cognitive development scores than the siblings in the control groups. They also found that chronic illnesses that involved daily treatment regimes were associated with more negative effects on siblings compared to chronic illnesses that did not affect daily functioning. These studies highlight the emotional burden and stress that healthy siblings of chronically ill children experience. Overall, these studies suggest that severity and chronicity of an illness could be a determining factor on the well-being of the healthy siblings.

Knowledge and Communication about the Illness

Studies of families of disabled children have shown that parents tend to expect more from their healthy children, but are unable to give them the time and attention they give to their disabled child (Simeonsson & McHale, 1981; McHale & Pawletko, 1992). One would expect that under such circumstances, healthy siblings might discuss their concerns and the sibling's illness with their parents; however, Faux (1991) found that although the healthy siblings reported that they occasionally worried about their ill sibling, they had never discussed their concerns with their parents or siblings. Stallard et al. (1997) reported that younger healthy siblings of children with life threatening conditions, in comparison to the older healthy siblings, and healthy brothers of children with life threatening conditions, in comparison to the healthy sisters, felt less able to talk with their parents or friends about their siblings' illness. Therefore, the present study examines the hypothesis that healthy siblings who do not discuss their siblings' illness, or have non-constructive discussions with their parents, are more likely to report negative sibling and family relationships.

A number of studies tend to support this hypothesis. Havermans and Eiser (1994) studied 21 healthy siblings of children who had been cancer free and off treatment for 2 years or less. Healthy children who had reported more open communication stated that their lives had been less affected as a result of their sibling's illness. Based on these results, Havermans and Eiser suggested that if parents openly discuss their differential treatment of the siblings this could reduce the negative impact of having a disabled sibling on the healthy sibling.

Williams et al.'s (2002) study of 252 siblings of children with chronic illnesses, such as cancer, diabetes, and autism, revealed that the healthy siblings' knowledge about the illness of their sibling had a significant but modest direct effect on the siblings' attitude toward the illness and its impact on self and the family. They also found that older siblings had more knowledge and a more positive attitude toward the illness than younger siblings.

McHale and Powletko (1992) studied 62 healthy Canadian children, half with a sibling with mental retardation and half with a healthy sibling. The study showed that more conversation between the healthy children with their mothers was associated with a more positive sibling relationship reported by the healthy siblings of children with a sibling with mental retardation. However, more conversation between the healthy children with their mothers was associated with a more negative sibling relationship reported by the healthy siblings in the control group.

Lobato and Kao (2002) carried out an intervention study for healthy siblings and parents of children with chronic illnesses and developmental disabilities such as autism spectrum disorders, medical disorders, and combined psychiatric and learning disorders. Their goal was to increase the healthy siblings' understanding of chronic illnesses and developmental disabilities, and to increase their adjustment to the siblings' illness through improving healthy siblings' knowledge and family information exchange. The result of the intervention study revealed

significant increases in siblings' ability to explain the disabled siblings' illness, and in siblings' connectedness. There was also a significant decrease in the negative adjustment of the healthy siblings (when reported by the siblings but not by the parents) and in both internalizing and externalizing problems in parents' reports on the Child Behavior Checklist. Based on a more recent intervention program for young siblings of children with chronic illness and developmental disabilities, Lobato and Kao (2005) hypothesized that increase in sibling knowledge could be associated with and reinforced by parents who are able to communicate more effectively regarding chronic illness and developmental disabilities with their children.

Kowal, Krull and Kramer (2004) suggested a possible advantage of communication in families in which parents treat their children differently. They suggested that through the discussions between the children and their parents regarding parental differential treatment, children could become aware of the reasons their parents are treating them differently. Therefore, it not only could help the children in correcting their misconceptions about parental differential treatment, but also would help the parents to be more fair in the treatment of their children.

Thus, knowledge about the illness of one's ill sibling and communication about the illness appear to improve the adjustment of healthy siblings and the relationship between healthy siblings and ill siblings.

Tourette Syndrome

Definition and Prevalence

"In 1885 Jean Charcot directed his clinical chief Georges Gilles de la Tourette to collect and publish cases of involuntary vocalizations and motor movements combined with cursing. Charcot renamed the disorder "Maladie des Tics de Gilles de la Tourette" in honor of his intern" (Kushner, 1999, p.27). Based on DSM-IV criteria, Tourette Syndrome includes the

presence of both (but not necessarily concurrent) multiple motor tics and one or more vocal tics that occur many times a day for more than one year, with the onset being before 18 years of age. The disturbance causes marked distress or significant impairment in social, occupational or other important areas of functioning (Diagnostic and Statistical Manual of Mental Disorders, 1994). The person can be relatively symptom free for some periods of time, but this becomes less frequent as the disorder progresses (Bauer & Shea, 1984).

Kadesjo and Gillberg (2000) investigated the prevalence of Tourette Syndrome in 7-year-olds in the general population of school children and in children referred to a clinic, during a four-year longitudinal study in Karlstad, Sweden. Their study revealed that, depending on the sample characteristics, between 0.15% and 1.1% of all children had Tourette Syndrome. Boys are between 4 and 6 times more likely than girls to have Tourette Syndrome.

In another study on the prevalence of Tourette Syndrome, Hornsey and Banerjee (2001) studied all grade 9 students, aged 13 and 14, in six schools in West Essex, United Kingdom, in order to find a robust estimate of the frequency of Tourette Syndrome in this specific age range. Information was obtained from the children, their parents, and their teachers. The results of the study showed a prevalence rate of 1.85% as a most conservative estimate. They suggested that Tourette Syndrome was more common than had been indicated by previous estimates. However, they suggested that schoolchildren with Tourette Syndrome have milder symptoms and their Tourette Syndrome is associated with fewer comorbid disorders than it is in adults.

In a study on the prevalence of tics, schoolchildren from 8.5-years-old to 17.5-years-old were studied in Rochester, New York (Kurlan, et al., 2001). The investigators found that 1.5% of special education students and 0.8% of regular students met the DSM-IV criteria for Tourette Syndrome. However, when they excluded the criterion that the disturbance should cause marked

distress or significant functional impairment, then they found 7% prevalence among special education students and 3.8% prevalence among regular students. Nonetheless, the investigators suggested the possibility that their rates were high due to selection bias in their sample.

Comorbid Disorders

Based on an international survey of individuals with Tourette Syndrome, on average they have over two additional disorders (Freeman, Fast, Burd, Kerbeshian, Robertoson & Sandor, 2000) including Attention Deficit Hyperactivity Disorder, Learning Disorders, Obsessive-Compulsive Disorder, Mood Disorders, and Anxiety Disorders (DSM-IV, 1994; Kushner, 1999; Robertson, et al., 1999). Recent studies have revealed an association between comorbid psychiatric disorders and episodic rage (aggressive behavior) in Tourette Syndrome (Budman, Bruun, Park, Olson, 1998; Budman, Rockmore, Stokes & Sossin, 2003). Tourette Syndrome can also be accompanied by coprolalia (impulsive swearing), copropraxia (impulsive obscene gestures), echolalia (repetition of phrases made by others), echopraxia (repetition of gestures made by others), and palilalia (repetition of phrases or words with increasing rapidity) (Bauer & Shea, 1984).

Studies have reported a prevalence of 23% to 40% (Stephens & Sandor, 1999) and 25% to 70% (Budman, Rockmore, Stokes & Sossin, 2003) for rage attacks in individuals with Tourette Syndrome. In their study on 3500 individuals with Tourette Syndrome in 22 countries, Freeman and his colleagues (2000) found that anger control problems and self-injurious behaviors were four times more frequent in Tourette Syndrome individuals with comorbid disorders than in a Tourette Syndrome only group. Budman, Bruun, Park, Lesser and Olson (2000) reported that children with Tourette Syndrome and rage attacks were more likely to have Attention Deficit Hyperactivity Disorder (ADHD), Obsessive-Compulsive Disorder (OCD), and

Oppositional Defiant Disorder. Stephens and Sandor (1999) also suggested that aggressive behaviour in children with Tourette Syndrome could be associated with ADHD and OCD, and independent of the severity of the tics and the age of the children. In contrast to results obtained by Stephens and Sandor (1999), in Kurlan et al.'s (2002) study individuals with severe tics had an increased frequency of aggressive behaviour**.**

Kurlan et al. (2002) reported studies that have suggested a prevalence rate of 3% to 85% for comorbid Obsessive-Compulsive Disorder, but a rate between 20 and 60 percent was more commonly reported. However, they suggest that in general a 30% rate of comorbidity of OCD and Tourette Syndrome is accepted.

Kurlan et al. (2002) reported studies that have suggested a prevalence rate of 40% to 70% for comorbid Attention Deficit Hyperactivity Disorder (ADHD). Those children with more severe tics had an increased frequency of ADHD and OCD. Spencer et al. (1998) reported that the rate of Obsessive-Compulsive Disorder and simple phobia were higher in Tourette Syndrome individuals with comorbid ADHD in a sample of clinically referred participants. They also found that the rates of comorbid disorders were associated with the severity of ADHD symptoms rather than tic severity. They reported that Tourette Syndrome comorbid with ADHD appeared to be a more severe disorder than ADHD alone, and in children with Tourette Syndrome the average level of psychosocial functioning was not affected by the severity of the tics.

Kadesjo and Gillberg's study (2000) is in concordance with Spencer et al.'s study. Kadesjo and Gillberg suggested that Attention Deficit Disorders and empathy problems caused more suffering than the tics by themselves. Children who had tics comorbid with ADHD/ DAMP (Deficits in Attention, Motor Control and Perception), and Autism Spectrum Disorder with either

mild or severe compulsions were among the most impaired children. The researchers acknowledged that the small sample size and referral bias were limitations in their study.

In their study of Tourette Syndrome comorbid with Obsessive-Compulsive Disorder (OCD), Coffey and her colleagues found that Tourette Syndrome comorbid with OCD was a more severe disorder than either of the two alone (Coffey, Miguel, Biederman, Baer, Rauch, Scott et al., 1998). Holtz's (2000) study also revealed that Tourette Syndrome children with comorbid OCD had more social difficulties, especially poorer self-esteem, and greater fear of negative social evaluation than the Tourette Syndrome only group. Thibert, Hy, and Sandor (1995) found that Tourette Syndrome individuals with severe obsessive and compulsive symptoms had higher social anxiety and lower self-concept in comparison to their Tourette Syndrome only peers and Tourette Syndrome individuals with mild obsessive-compulsive symptoms.

Sukhodolsky et al. (2003) studied the disruptive behaviour of children with Tourette Syndrome and its association with comorbid Attention Deficit Hyperactivity Disorder (ADHD). The researchers found that the group with Tourette Syndrome comorbid with ADHD did not differ from the group with ADHD in disruptive behaviour and scored significantly higher than the group with only Tourette Syndrome and the control group (the latter did not differ from each other). With respect to conduct problems, the group with Tourette Syndrome comorbid with ADHD did not differ from the group with ADHD and scored significantly higher than the control group, but not higher than the group with Tourette Syndrome. However, the results of the Family Environment Scale (FES) revealed that the group with Tourette Syndrome comorbid with ADHD and the group with ADHD lived in families with significantly greater levels of family

dysfunction, as revealed by higher scores in conflict and cohesion scores. The Tourette Syndrome and the control group did not differ from each other in their FES scores.

Researchers also found a significant positive correlation between the number of comorbid disorders and the impact of Tourette Syndrome on the family (Wilkinson et al., 2002). The group with Tourette Syndrome comorbid with Attention Deficit Hyperactivity Disorder, Obsessive-Compulsive Disorder, and Oppositional Defiant Disorder or Conduct Disorder had significantly higher scores in the Family Impact Scale than the group with only Tourette Syndrome, indicating that Tourette Syndrome had a stronger impact on the former group.

Although there are some inconsistencies in the results of comorbidity studies, overall these studies suggest that more complex disorders tend to be more severe, and to have a more negative impact not only on the individual but also on the family.

Because of the high prevalence rate of comorbid rage, ADHD and OCD the present research includes reports of these three disorders. It is hypothesized that number and severity of comorbid disorders could be considered as an index of severity of Tourette Syndrome, with more comorbid disorders being associated with more severe Tourette Syndrome. Greater severity of Tourette Syndrome (indicated by Tourette Syndrome severity index), and more frequent and more severe comorbid disorders should be associated with more negative outcomes in sibling and family relationships, such as more sibling conflict and less family cohesion, as suggested by the research reported below.

Family Relationships in Families with a Child with Tourette Syndrome

As Hubka, Fulton, Shady, Champion, and Wand (1988) have suggested, "an illness which affects one member of the family affects the family system as a whole" (p. 259). Edell-Fisher and Motta (1990) concur: "Tourette Syndrome like other chronic disorders affects the

entire family …" (p. 540). Yet, there are few studies on sibling and family relationships in individuals with Tourette Syndrome. Past studies have reported a negative psychological impact on the healthy siblings of children with Tourette Syndrome; however, the present study does not examine the mental health of the family members. Rather, it emphasizes the relationship between the siblings and among the family members.

The following studies are among very few studies on family relationships in families with a child with Tourette Syndrome. Eustace (1984) studied the personal adjustment and family adaptation in siblings of individuals with Tourette Syndrome. In this study, siblings of children with Tourette Syndrome were compared to children with Tourette Syndrome and with a control group of healthy siblings. Each group consisted of 20 participants. The siblings of children with Tourette Syndrome and the control group were matched on age, sex, race, sex of the sibling, birth order, socio-economic status, school placement, and status of parents' marriage. The siblings of children with Tourette Syndrome were tested by different measures, including FACES-Π which measured family cohesion and adaptability, and a semi-structured clinical interview. The control group was tested by the same measures except for the interview. Mothers in both Tourette and control groups answered several scales from the Personality Inventory for Children – Revised. The mothers of the children with Tourette Syndrome answered the same scales separately for their healthy child and the child with Tourette Syndrome. The results revealed that siblings of children with Tourette Syndrome (and children with Tourette Syndrome) reported lower levels of family cohesion and adaptability than children in the control group. Siblings of children with Tourette Syndrome were more dissatisfied (than their siblings) with their family cohesion, and were more dissatisfied with family adaptability than were children in the control group. The study also showed an age effect in which siblings who were

older than the child with Tourette Syndrome had significantly higher withdrawal scores than did younger healthy siblings.

Hubka and his colleagues studied 210 subjects who had participated in a survey conducted by the Tourette Syndrome Foundation of Canada (Hubka, Fulton, Shady, Champion, and Wand, 1988). The results revealed that more than 58% of family members claimed that having a family member with Tourette Syndrome interfered with the family's daily activities. However, a major limitation of the study was that a variety of participants (e.g., parent, individual with Tourette Syndrome) took part in the survey and the questions only revealed a global impact of Tourette Syndrome on the family.

Kearns (1990) studied three groups of families. These included families with a child with Tourette Syndrome, families with a child with Conduct Disorder, and a non-clinical group, all with a child age of 12 to 19 years-old. Kearns investigated the perceptions of fathers, mothers, and their children with Tourette Syndrome and Conduct Disorder regarding general patterns of family functioning, organization and hierarchy. The results revealed that both fathers and mothers in Tourette Syndrome and Conduct Disorder groups perceived their families as less healthy than parents in the non-clinical group.

Loman (2000) studied the quality of sibling relationship between the healthy children and their chronically ill siblings in families with either a Diabetic or Tourette Syndrome child. Both Tourette Syndrome and Diabetes are chronic disorders; however, they differ in visibility and presence of psychological symptoms (Loman, 2000). Loman compared Tourette Syndrome to Diabetes in order to differentiate the impact of the stigma associated with the overt symptomatology of Tourette Syndrome. She hypothesised that because of the visibility of Tourette Syndrome symptoms, the children with Tourette Syndrome might be teased by their

peers, have more conflictual relationships with their siblings, and have less positive interactions with their peers. Loman also hypothesized that mothers of children with Tourette Syndrome would show more depression, parenting stress and parenting difficulties. In her study, Loman compared 37 families with a child with Diabetes, and 11 families with a child with Tourette Syndrome, to 49 families with healthy children. Since the group was made up of older healthy sisters and younger ill brothers, analysis across the groups only included this specific gender dyadic combination to control for the gender combination of the dyads. Siblings' interactions during Etch-a-Sketch and a tournament game were videotaped; siblings also completed the Sibling Relationship Questionnaire (SRQ), which assessed warmth, conflict, power, and rivalry among siblings. Parents completed different measures including the Family Environment Scale to assess family adjustment and the Parenting Stress Index to assess the magnitude of stress in parent-child relationships. The results revealed that illness did not have a significant effect on reported aggression (obtained from SRQ and interviews with mothers) and observed aggression (reported by research assistants observing siblings during Etch-a-Sketch and the tournament game). Siblings of children with Tourette Syndrome showed more observed warmth than siblings of children with Diabetes but not more than siblings of healthy children. The results were contrary to what was expected. Information obtained from the mothers also showed that there was no significant effect of illness on mothers' reports of stressful life events. However, families of children with Tourette Syndrome showed higher levels of family conflict than the healthy comparison group, and less cohesion than families with a diabetic child and healthy families. Children with Tourette Syndrome were reported to be more difficult on the Child Demandingness subscale of the Parenting Stress Index than their counterparts in the healthy and diabetic groups. In general Loman's study revealed that there was almost no difference in the

quality of sibling relationship in children with a chronically ill sibling and children with a healthy sibling. However, there were differences in parent-child relationships.

Cooper and Livingston (2003) studied caregiver burden in families with a child with Tourette Syndrome (with mild to moderate degrees of tics, and different comorbid disorders, including ADHD, OCD, Oppositional Defiant Disorder and self-injurious behaviour, etc.) and compared them to families with a child with Asthma. They reported that the mothers of children with Tourette Syndrome reported significantly more impact on their relationships, activities, and mental and physical well-being than the mothers of children with Asthma. The effect of severity of tics and comorbid disorders was not examined.

Overall, the results of past studies on sibling relationship in families with a child with Tourette Syndrome are limited and inconclusive. In general, these studies suggest that the family dynamics are far from being perceived as agreeable. In order to investigate sibling and family relationships in these families, the present study examines warmth and conflict in sibling relationships as indices to measure sibling relationships, and cohesion and adaptability in family relationships as indices to measure family relationships.

Summary of Hypotheses

Severity

1.1 Tourette Syndrome, Obsessive-Compulsive Disorder tendencies, Attention Deficit Hyperactivity Disorder tendencies and rage are associated.

1.2 More severe Tourette Syndrome comorbid with more frequent and severe ADHD tendencies, OCD tendencies and rage is associated with less sibling warmth, more sibling conflict, and less cohesion and adaptability in the family.

1.3 More severe Tourette Syndrome comorbid with more frequent and severe ADHD tendencies, OCD tendencies and rage is associated with stronger perception of maternal differential treatment, and unfairness of maternal differential treatment.

1.4 More severe Tourette Syndrome comorbid with more frequent and severe ADHD tendencies, OCD tendencies and rage is associated with less communication between the parents and the healthy siblings.

Maternal Differential Treatment and Fairness Evaluation

2.1 Stronger perception of maternal differential treatment is associated with less sibling warmth, more sibling conflict, and less cohesion and adaptability in the family.

2.2 Stronger perception of unfairness of maternal differential treatment is associated with less sibling warmth, more sibling conflict, and less cohesion and adaptability in the family.

2.3 Fairness evaluation of maternal differential treatment should moderate the effect of maternal differential treatment on sibling warmth and conflict, and family cohesion and adaptability.

2.4 Fairness evaluation of maternal differential treatment should moderate the effect of severity of Tourette Syndrome and comorbid tendencies on sibling warmth and conflict, and family cohesion and adaptability.

Communication

3.1 Communication regarding Tourette Syndrome between the healthy child and the parents is associated with more sibling warmth, less sibling conflict, and more cohesion and adaptability in the family.

3.2 Less communication regarding Tourette Syndrome between the healthy child and the parents is associated with stronger perception of maternal differential treatment, and unfairness of maternal differential treatment.

3.3 Effective communication about Tourette Syndrome between the healthy sibling and the parents would moderate the effect of severity of Tourette Syndrome and comorbid tendencies on sibling warmth and conflict, and family cohesion and adaptability.

3.4 Effective communication about Tourette Syndrome between the healthy sibling and the parents would moderate the effect of fairness evaluation of maternal differential treatment on sibling warmth and conflict, and family cohesion and adaptability.

3.5 Effective communication about Tourette Syndrome between the healthy sibling and the parents would moderate the effect of maternal differential treatment on fairness evaluation of maternal differential treatment.

Research Questions

1.1 Age differences may moderate the effect of communication on sibling warmth and conflict, and family cohesion and adaptability.

1.2 Age differences may moderate the effect of maternal differential treatment on sibling warmth and conflict, and family cohesion and adaptability.

1.3 Age differences may moderate the effect of fairness evaluation of maternal differential treatment on sibling warmth and conflict, and family cohesion and adaptability.

Method

Participants

One-hundred-thirty parents took part in the study. The information from 55 of the parents was used in the data analysis. These participants were parents whose healthy children also completed the required questionnaires. Of these 55 families, 46 healthy siblings had completed all the required questionnaires, and 9 had completed some of the required questionnaires. Of the 9 healthy siblings who had completed some of the required questionnaires, 8 completed the communication questionnaire, 6 had completed the Family Adaptability and Cohesion Evaluation Scale (FACES-II), 5 completed the Sibling Relationship Questionnaire (SRQ), and 4 completed the Sibling Inventory of Differential Experience (SIDE). The missing data for the healthy siblings were replaced using EM-based imputations (Statistical Product and Service Solutions 14) (see Appendix A). Of the 46 healthy siblings who had completed all the required questionnaires, 15 had not completed the SIDE for the father because the father was not living with them. Therefore the data on father-SIDE for healthy siblings was not used in the analyses.

The study required the participating healthy siblings to be at least 10-years-old; however, 3 of the siblings were younger (2 were 7.67 years-old and one was 8.50 years old). It was assumed that younger children would not have the necessary computer skills and maturity to answer online questionnaires. Of the 3 participants who were younger than the minimum required age, 2 had only completed 2 of the required questionnaires and only one had completed all the required questionnaires. These 3 participants had reported that they had understood the questions well and had sometimes asked questions from their parents. To ensure that the healthy siblings had understood the questions, at the end of each questionnaire they were asked two questions regarding the extent to which they understood the questions and help they received

from their parent/s to answer the questionnaire. They had to choose from a 5-point Likert scale the extent to which they understood the questions (1 = very well, 5 = not at all), and the extent of help they received from their parents (1 = all the time, 5 = never). The mean and standard deviation for understanding the questionnaires and amount of help received from the parents in the communication, Sibling Inventory of Differential Experience, Family Adaptability and Cohesion Scale, and Sibling Relationship Questionnaire are reported in Appendix B.

The healthy siblings in the study were on average slightly older than the siblings with Tourette Syndrome (see Table 1). The gender distribution between the healthy siblings and the siblings with Tourette Syndrome was not evenly distributed. As expected due to the greater prevalence of Tourette Syndrome among males, there were more males among the siblings with Tourette Syndrome than the healthy siblings (see Table 1). The families in the study were relatively small and were mainly English speaking (see Table 2).

Table 1

Demographic Information for the Healthy Sibling and Sibling with Tourette Syndrome

Sibling	Age		Gender		
	Range	Mean (SD)	Female	Male	Unknown
Healthy	7.67-22.08	13.15 (3.01)	40% (N=22)	54.5% (N=30)	5.5% (N=3)
With TS	2.42-20.42	12.25 (3.78)	10.9% (N=6)	89.1% (N=49)	0% (N=0)

Note. The average age difference between the siblings was 3.33 years, SD= 2.67.

Table 2

Frequency and Percentage for Healthy Siblings' Age Relative to Sibling with Tourette Syndrome, Number of Siblings, and First Language of the Participants

	Older[a]		Number of other siblings[b]					First Language	
	Healthy Sibling	Sibling with TS	0	1	2	3	4	English	Other
Frequency	30	21	23	16	6	3	1	53	2
Percentage	54.5	38.2	41.8	29.1	10.9	5.5	1.8	96.4	3.6

a. Comparison between healthy sibling and sibling with TS in each family, age difference between 7.3% of the sibling dyads was unknown (N=4). b. Siblings other than the healthy sibling and sibling with Tourette Syndrome in each family.

The parents were asked about the diagnosis of their child with Tourette Syndrome. Parents reported that all the children with Tourette Syndrome but one had been diagnosed with Tourette Syndrome by a professional. Based on parents' reports all the children with Tourette Syndrome had comorbid ADHD and rage, and 80% (N=44) had comorbid OCD. Parents also reported that 43 (78.2%) of the children with Tourette Syndrome had been diagnosed with comorbid tendencies by a professional (see Table 3). Parents reported that in addition to ADHD, OCD and rage, 20 (36.4%) of their children with Tourette Syndrome had one or more additional disorders (e.g., Oppositional Defiant Disorder, Anxiety Disorder).

Table 3

Frequency and Percentage of Professionals who Diagnosed Tourette Syndrome and Comorbid Tendencies (N=55)

	Tourette Syndrome		Comorbid Tendencies	
Professional	Frequency	Percentage	Frequency	Percentage
Family Physician	4	7.3	6	10.9
Neurologist	18	32.7	6	10.9
Neuropsychologist	1	1.8	1	1.8
Pediatrician	14	25.5	9	16.4
Psychiatrist	14	25.5	17	30.9
Psychologist	3	5.4	4	7.3
No Professional Diagnosis	1	1.8	12	21.8

Of the parents who participated in the study, 92.7% were mothers (N=51) and 7.3% were fathers (N=4). On average, the mothers in the families were younger than the fathers and were slightly more educated than the fathers (see Table 4). The families were not asked about their income; rather they were asked about their occupations. The parents held a variety of jobs and were mainly in highly-skilled professions (see Table 4). From the 32 participants who took part in the study and provided their address, 46.87% were Canadian (N = 15), 40.63% were American (N = 13), 6.25% were British (N=2) and 6.25% were Australian (N=2), and the nationality of the remaining 23 participating families was unknown.

Table 4

Demographic Information for the Mothers and Fathers

	Mother	Father
Age		
Range	27.09-53 yrs.	34-56 yrs.
Mean	39.51	42.1
Standard Deviation	5.83	5.53
Education		
Less than High School	3.6% (N= 3)	20% (N=13)
High School Graduate	20% (N=11)	29.1% (N=16)
College or University	74.5% (N=41)	43.6% (N=24)
Occupation		
Lower-Skill Job[a]	0% (N=0)	18.2% (N=10)
Medium-Skill Job[b]	12.7% (N=7)	34.5% (N=19)
High-Skill Job[c]	34.5 (N=19)	30.9% (N=17)
Not Employed	34.5% (N=19)	7.3% (N=4)
Unknown Job	3.6% (N=2)	9.1% (N=5)

a. No training required. b. Some training required. c. Highly professional training required.

Procedure

This study was designed as an online survey in which participants could visit the survey's website (http://mrosslab1.uwaterloo.ca/ts) from any computer with internet connection. The study was advertised in different Tourette Syndrome chatrooms, discussion forums, locations and websites including Tourette Syndrome Foundation of Canada's homepage, Tourette Syndrome Plus and Life's A Twitch websites, Tourette Syndrome clinic at Toronto Western Hospital, Massachusetts General Hospital, and Child and Parent Resource Institute. The survey's home page consisted of two parts. One part consisted of information regarding the researcher, the study and a participation button for individuals to choose if they were interested in participating in the study. The other part included a login section for participants who had already participated and wanted to complete the remaining questionnaires, and music buttons for controlling the music. Upon choosing the participation button, a guideline page appeared. This page consisted of information regarding study's requirements and eligibility criteria. Since there was no direct way of obtaining consent for younger participants, the parent was advised that the survey could only be initiated by the parent of the individual with Tourette Syndrome. At the end of the page a button was designed for the parents to choose, acknowledging that they were the parents. After choosing this button, a consent page appeared. The consent page advised parents regarding their rights to participate and withdrawal, and of confidentiality. Parents had to give a positive response to a question regarding their agreement to participate in the study.

Once parents chose the yes button, the demographic information page appeared. Until this point the parents would not have been registered as participants. Once parents completed the demographic page and chose the button to confirm their participation, the survey progress page appeared. In this page a family identification code was assigned to each family. The parent,

healthy sibling and sibling with Tourette Syndrome could use this code to log onto the website and continue with their remaining questionnaires at any time. This page also had a pictorial demonstration for each participating family member to inform them of the number of completed and non-completed questionnaires. The questionnaires appeared in a randomized order. Once they started a questionnaire, the participants were required to complete that questionnaire. However, they were able to return later and complete the remaining questionnaires. Once participants submitted a questionnaire, their responses were irreversible. On the demographic page, the participants were asked to provide an email address if they wished to receive reimbursement for their participation. Once a questionnaire was completed, participants could choose to proceed with another questionnaire (save and continue button) or stop and continue at a later time (save and stop button). If participants had missed any questions, they would be reminded of the missing questions once they chose save/stop or save/continue button. At this point they could either go back and complete the missing questions or choose the save buttons again.

None of the children with Tourette Syndrome and their participating healthy siblings had left their parents' house; therefore none of the participants answered the questionnaires retrospectively. The website consisted of two different types of questionnaires (see Table 5); Those that were called "required" for essential family data in the study, and "optional" questionnaires that family members could answer at their discretion. The healthy sibling and the parent each had to answer 5 required questionnaires; the required questionnaires for the parent and the healthy sibling were different. The sibling with Tourette Syndrome and the parents could answer 5 optional questionnaires, which were the same as required questionnaires for the healthy sibling. The required questionnaires for the parent consisted of the demographic questionnaire,

the Yale Global Tic Severity Scale-Family Rated (YGTSS), the Yale-Brown Obsessive Compulsive Scale Y-BOCS, the Conners' Parent Rating Scale-Revised-Short Form (CPRS-R-S), and the Overt Aggression Scale (OAS). The required questionnaires for the healthy sibling consisted of the communication questionnaire, the Family Adaptability and Cohesion Evaluation Scale (FACES-II), the Sibling Inventory of Differential Experience (SIDE), and the Sibling Relationship Questionnaire (SRQ). The Sibling Inventory of Differential Experience (SIDE) had been divided into 2 separate questionnaires because of its length. Questions regarding the mother were in one questionnaire and questions regarding the father were in a separate questionnaire. Completing the required questionnaires qualified the family to receive a reimbursement of 20 Canadian dollars for each participating family member. Once the parent and healthy sibling completed the required questionnaires, they received an email of appreciation for their participation, and a request for their address.

Table 5

Required and Optional Scales for Different Participants

Questionnaire	Parent	Healthy Sibling	Sibling with Tourette Syndrome
Required	YGTSS	SIDE	none
	Y-BOCS	FACES-II	none
	CPRS-R-S	SRQ	none
	OAS	Communication	none
Optional	SIDE	none	SIDE
	FACES-II	none	FACES-II
	SRQ	none	SRQ
	Communication	none	Communication

Note. The parent was required to complete the demographic questionnaire

Yale Global Tic Severity Scale-Family Rated (YGTSS) (Leckman et al., 1989c). This scale rated symptoms' severity in individuals with Tourette Syndrome. This scale was completed by the parent. However, the parent could consult with the child in order to complete the scale, since it was assumed that no one knew the experienced symptoms better than the child with Tourette Syndrome. The original scale has two versions: one is clinician rated and the second version is family rated. The family rated version was used in the present study. The first part of the scale asked 29 yes or no questions about different motor tics, and the second part of the scale asked 12

questions about different vocal tics, if they had been experienced over the last 12 months. The maximum score in the 2 sections could be 41. The scale also included separate ratings of severity for motor and phonic tics along 3 dimensions: frequency, intensity, and interference. In each of the dimensions the parent had to report separately on motor tics and vocal tics, during the last 12 months. In all 3 dimensions the parent had to choose from a 5-point Likert scale. The scores for the first section (symptom checklist) and the second section (frequency, intensity and interference) were added up and a total score was calculated. The maximum severity score could be 71. The higher the score, the more severe the Tourette Syndrome. To verify that siblings with Tourette Syndrome met the DSM-IV criteria for Tourette Syndrome the parents' responses to YGTSS and demographic questionnaires were examined. All the siblings with Tourette Syndrome met the DSM-IV criteria for presence of multiple motor tics and one or more phonic tics. All the siblings with Tourette Syndrome met the criterion for the frequent occurrence of tics during the day. Of the 55 families 90.9% (N=50) met the interference criterion indicating that Tourette Syndrome interfered with the functioning of the sibling with Tourette Syndrome. The parents' reports regarding the time since diagnosis of Tourette Syndrome was used as a proxy for evaluating the DSM-IV criterion of presence of tics for over a year. However, this did not mean that children who were diagnosed with Tourette Syndrome in less than a year did not have tics for over a year. Of the 55 families, 85.4% (N=47) had a child with Tourette Syndrome that had been diagnosed for over a year prior to the time of the study, and 9.1% (N=5) had a child with Tourette Syndrome that had been diagnosed less than a year prior to the study. The time since diagnosis for 5.5% (N=3) of the children with Tourette Syndrome was unknown.

It takes between 10-to-20 minutes to complete the scale. The scale has high internal consistency ($\alpha = .93$), high convergent validity ($r = .67$ with Tourette's Disorder Scale-Parent

Rated Tics factor or TODS-PR Tic) and high discriminant validity (r = .07 with TODS-PR OCD, r = .11 with TODS-PR ADHD, r = .16 with TODS-PR Aggression, and r = .10 with CY-BOCS) (Leckman et al., 1989; Storch et al., 2005). The present study showed reliability α = .848 for YGTSS.

Yale-Brown Obsessive Compulsive Scale (Y-BOCS) (Goodman et al., 1989c). This scale rated symptom severity of comorbid Obsessive-Compulsive Disorder tendencies. The parent completed the scale. However, the parent could consult with the child in order to complete the scale. Five items measured the severity of obsessions and 5 items measured the severity of compulsions. The parent had to choose from a 5-point Likert scale, and was asked to report based on the child's experience in the last year. The maximum severity score could be 50, and higher numbers indicated more severe OCD tendencies. The scale has high interrater reliability (r = .89) and high internal consistency b = .89 (Goodman et al., 1989b). The convergent validity of Y-BOCS obtained by its correlation with Clinician's Global Impression-Obsessive Compulsive Scale (CGI-OCS) was .85. The discriminant validity of the scale obtained by its correlation with Hamilton Depression Rating Scale (HAM-D) and Hamilton Anxiety Scale (HAM-A) was .38 and .11, respectively (Goodman et al., 1989a). The present study showed reliability of α = .957 for Y-BOCS.

Conners' Parent Rating Scale-Revised-Short form (CPRS-R-S) (Conners, 1997). This scale was originally used to characterize patterns of child behaviour that indicate ADHD. In this study CPRS-R-S was used to measure severity of comorbid ADHD tendencies. The parent had to complete the scale for the last twelve months. Only the ADHD index with 10 items was used in the final data analyses. Each item consisted of a 5-point Likert scale (1 = never, 5 = very often).

The maximum severity score could be 50, and the higher the score the more severe the ADHD. High reliability and excellent internal consistency ($\alpha = .91$) have been reported for the ADHD scale (Kumar & Steer, 2003). Conners has reported total reliability coefficients from .857 to .938 (Conners, 1997). The present study showed a reliability of $\alpha = .948$ for Connor's ADHD scale.

Overt Aggression Scale (OAS) (Silver & Yudofsky, 1991). This questionnaire measured aggressive behaviours in the child with Tourette Syndrome in the last 12 months, and was completed by the parent. The aggressive behaviours in the questionnaire were divided into 4 different types, including verbal aggression, physical aggression against objects, physical aggression against self, and physical aggression against others. Each type of aggression was scored in terms of 4 exemplars which varied in severity. The most severe item that was chosen became the score for that type of aggression. Verbal aggression was scored 1-to-4, physical aggression against objects was scored 2-to-5, and physical aggression against self and others each were scored 3-to-6. The global score is called the aggression score, which is the sum of the weighted scores of the most severe aggressive behaviours in each aggressive type. The maximum aggression score could be 21, and the higher the score the more severe the aggression. The scale has a good reliability of greater than .75 (Silver & Yudofsky, 1991). No validity has been reported. The parent completed this scale. The present study showed reliability of $\alpha = .815$ for OAS.

Sibling Inventory of Differential Experience (SIDE) (Daniels & Plomin, 1984). This inventory is designed to evaluate non-shared family environment. Eighteen questions evaluating parental treatment from the original questionnaire were used in the present study. These questions were from scales that measured differential maternal affection, differential maternal control, differential paternal affection, and differential paternal control. Eight more questions

were added by the researcher to evaluate maternal and paternal differential treatment regarding chores at home and time spent with the children. All scales consisted of 5-point Likert scales (1 = toward sibling much more, 5 = toward me much more). The total score for each subscale was obtained by averaging all the items in that scale. The differential maternal and paternal affection scores and the amount of time spent scores were reverse-coded so that in all the scales, a higher score would indicate favoring the child with Tourette Syndrome and a lower score would indicate favoring the healthy sibling. Therefore, higher scores in parental differential chores, affection, control and time, respectively, indicated that parents expected more chores from the healthy sibling, parents expressed less affection toward healthy sibling, parents used more discipline toward the healthy sibling and spent less time with the healthy sibling, in comparison to the sibling with Tourette Syndrome. To evaluate perceptions of fairness, one question was added to each item. Fairness was measured on a 5- point Likert scale (1 = very fair, 5 = very unfair). The total fairness score for each subscale was obtained by calculating the average score for all the fairness items in that scale. Each participant was also asked to explain why he or she thought that the mentioned parental behaviour was fair or unfair. This inventory provided 8 separate scores for maternal and paternal differential treatment regarding chores, affection, control and time. A significant number of the participants did not answer the paternal differential treatment questions since they did not live with their fathers. Therefore, only the maternal differential treatment questions were used in the final analyses. The healthy sibling was required to complete this inventory; however, completing this inventory was optional for the parent and the sibling with Tourette Syndrome. The test-retest reliability of SIDE ranged from .77-to-.93. Intercorrelations among scales have been low to moderate (Daniels & Plomin, 1984). For the healthy siblings the present study showed reliability of $\alpha = .860$ for maternal differential

treatment scale, and $\alpha = .760$ for the whole scale including maternal and paternal differential treatment scales. Twenty-seven of the parents also completed this scale and the inter-rater reliability between the healthy siblings and their parents for maternal differential treatment was r = .459, $p<.05$. The correlation between healthy siblings' and their mothers' reports of fairness evaluation of maternal differential treatment was not significant.

Family Adaptability and Cohesion Evaluation Scale-II (FACES-II) (Olson, Bell & Portner, 1992). This scale is constructed based on the Circumplex Model, which suggests three principal dimensions in family behavior including cohesion, adaptability and communication. Only the cohesion and adaptability scales were used in the present study and the communication scale was not used since it was not related to the goal of the research.

a) The family cohesion scale assessed the degree to which family members were separated from or connected to their family. Family cohesion is defined as the emotional bonding that family members have towards one another. The family cohesion scale consisted of 16 items that measured emotional bonding, family boundaries, coalitions, time, space, friends, decision-making, interests and recreation. The items were measured on Likert scales of 1 to 5. The maximum cohesion score could be 80. Based on the Circumplex model, family cohesion extends from extremely low to extremely high cohesion. The two extreme poles are labelled as disengaged (1-50) and enmeshed (71-80), and the two moderate or balanced levels are labelled as separated (51-59) and connected (60-70).

b) The family adaptability scale assessed the extent to which the family system was flexible and able to change. Family adaptability is defined as the ability of a marital or family system to change its power structure, role relationships, and relationship rules in response to situational and developmental stress. The family adaptability scale consisted of 14 items that

measured family power (assertiveness, control, and discipline), negotiation style, role relationships and relationship rules. Fourteen items measured these scales. The items were measured on a Likert scale of 1-to-5. Maximum adaptability score could be 70. Based on the Circumplex Model, family adaptability extends from extremely low to extremely high. The two extreme poles are labelled as rigid (1-39) and chaotic (55-70), and the two moderate and balanced levels are called structured (40-45) and flexible (46-54). The healthy sibling was required to complete this inventory; however, completing this inventory was optional for the parent and the sibling with Tourette Syndrome.

The internal consistencies for the family cohesion and adaptability scales were .87 and .78, respectively (Olson, Portner & Bell, 1992). The test-retest reliability for family cohesion and adaptability scales were .83 and .80, respectively (Olson, Portner & Bell, 1992). Olson and his colleagues (1992) reported a concurrent validity of .93 and .79 for cohesion and adaptability, respectively, obtained by correlation between Self-Report Family Inventory (SFI) and FACES-II. The present study showed reliability of $\alpha = .618$ for the cohesion scale and $\alpha = .785$ for the adaptability scale.

The present study also showed a correlation of $r = .796$ between the cohesion and adaptability scales. The significant correlation between these two scales was disappointing since it could create the possibility of redundancy and overlap between the two scales. However, this is not the first study to find such a high correlation between cohesion and adaptability scales. Other studies have also shown high correlations between the two scales both in Faces-II (Compton, Thompson & Kaslowand, 2005) and Faces-III (Dundas, 1994). The present study showed reliability of $\alpha = .618$ for cohesion scale and $\alpha = .785$ for adaptability scale. Twenty-seven of the parents in the present study completed the FACES and inter-rater reliability between parents and

their healthy siblings' responses was r = .737, $p<.01$ for family cohesion and r = .847, $p<.01$ for family adaptability.

Sibling Relationship Questionnaire (SRQ) (Furman & Buhrmester, 1985). This questionnaire measures the nature of children's relationships with their siblings. The questionnaire contains 16 scales in 2 versions, with 48 items and 39 items. The longer version was used in the present study. Principal component analysis has revealed that the 16 scales consist of 4 factors: warmth and closeness, conflict, status and power, and rivalry. The items related to the rivalry and power factors were excluded from the present study, either because they overlapped with the parental differential treatment scale or because they were unrelated to the goals of the study. The warmth and closeness factor consisted of 7 subscales for intimacy, prosocial behavior, companionship, similarity, admiration by sibling, admiration of sibling, and affection. The conflict factor consisted of 3 scale scores for quarrelling, antagonism, and competition. Twenty-one items measured the warmth/closeness factor across the 7 subscales. The final warmth and closeness score was derived by averaging the scores in the 7 subscales. Eight items measured the conflict factor. The final conflict score was derived by averaging the scores for these 8 items. Each item consisted of a 5-point Likert scale (1 = hardly at all, 5 = extremely much). Higher scores indicated more warmth and more conflict in the sibling relationship. The healthy sibling was required to complete this questionnaire; however, completing this questionnaire was optional for the parent and the sibling with Tourette Syndrome. The test-retest reliability for warmth and conflict scales are r = .85 and r = .68, respectively. The internal consistency for warmth and conflict scales are $\alpha = .90$ and $\alpha = .68$, respectively. The convergent validities based on the correlation between the warmth scale on SRQ and the affect and activities scales on the Family Environment Scale (FES) were .58 and

.47, respectively. The convergent validities based on correlation between conflict scale on SRQ and affect and activities scales on FES were -.59 and -.33, respectively (Moser & Jacob, 2002). The present study showed a correlation of r = -.325 between the warmth and conflict scales. The present study also showed reliability of α = .918 for the warmth scale and α = .882 for the conflict scale. Twenty-seven of the parents in the present study completed the SRQ for the relationship between their children and inter-rater reliability between the parents and their healthy siblings' reports was r = .670, $p<.01$ for sibling warmth and r = .626, $p<.01$ for sibling conflict.

Communication Questionnaire. A self-made communication questionnaire with 7 items was used to assess effective communication regarding Tourette Syndrome between the parents and their children. The questionnaire asked the participants about their knowledge regarding Tourette Syndrome, how they learned about Tourette Syndrome, the amount and type of discussion between the parents and the healthy child regarding Tourette Syndrome, and their satisfaction with their discussions. Each item consisted of a 5-point Likert scale. The participants were also asked to elaborate on their responses. Higher scores indicated more knowledge regarding Tourette Syndrome, more constructive discussions regarding Tourette Syndrome, fewer confrontational discussions, inclination to speak with the parents regarding Tourette Syndrome, and believing that discussions with parents have helped the sibling relationship with the sibling with Tourette Syndrome. The healthy sibling was required to complete this questionnaire; however, completing this questionnaire was optional for the parent. Only 2 of the items on the questionnaire which were highly correlated were standardized and aggregated into one score and used as an index score for communication; these items were knowledge about Tourette Syndrome and constructive discussion regarding sibling's Tourette Syndrome with the

parents. The other items were not used in the final analysis since they were not significantly correlated with the remaining items, and using them would lower the internal consistency of the test and compromise reliable results. The correlation between the two items that were used was .617 (N= 48, p<.01). The present study showed reliability of α = .763 for the two item scale. The correlation between responses of 27 of the parents who completed this questionnaire and the healthy siblings' answers in constructive discussions was not significant (r = .176).

All scales used in the study are reported in Appendices G to S. The summaries of reliability analyses for scales used in the study are reported in Appendix E.

Results

Severity

Relationship between Tourette Syndrome and Comorbid Tendencies. Past studies have suggested that aggressive behaviour in children with Tourette Syndrome could be associated with ADHD and OCD (Stephens & Sandor, 1999), and other studies have suggested that individuals with severe tics had an increased frequency of aggressive behaviours (Kurlan et al., 2002). Past studies had also suggested that Tourette Syndrome comorbid with ADHD was a more severe disorder than ADHD alone (Spencer, et al., 1998), and that Tourette Syndrome comorbid with OCD was a more severe disorder than either of the two alone (Coffey et al., 1998). The results of these studies support the association among Tourette Syndrome and comorbid tendencies, and that the combination of the disorders would be considered a more severe disorder than either of them alone. Therefore, it was hypothesized that Tourette Syndrome, and tendencies toward Obsessive-Compulsive Disorder, Attention Deficit Hyperactivity Disorder and rage are associated. The results of the present study supported the

association among Tourette Syndrome, ADHD, OCD and rage. All of the parents indicated that their children with Tourette Syndrome had associated comorbid tendencies and most noted that professional diagnosis provided the basis of their reports. Additionally, as predicted, parent ratings of the severity of Tourette Syndrome were associated with ratings of the severity of other comorbid tendencies (see Table 6). Significant correlations among the severity measures for Tourette Syndrome, OCD, ADHD and rage warranted the decision to combine the measures in order to obtain a single severity index. Therefore, the total severity scores for each measure were converted to standardized z-scores, and the sum of the standardized scores was used as a severity-comorbidity index for severity of Tourette Syndrome and comorbid tendencies collectively. The Cronbach's alpha for the combined index was .901. The results of the analysis supported the hypothesis 1.1, showing significant association between severity of Tourette Syndrome and severity of comorbid tendencies.

Table 6

Correlation Matrix for Tourette Syndrome, OCD, ADHD, and Rage Severity Measures

	TicSeverity	Rage	ADHDSeverity
OCDSeverity	.432** (N=54)	.389** (N=54)	.479** (N=54)
ADHDSeverity	.563** (N=55)	.498** (N=55)	
Rage	.452** (N=55)		

** $p < .01$.

Relationship between TS Severity including Comorbidity with Sibling Relationship. It was hypothesized that more severe Tourette Syndrome including comorbid tendencies would be associated with less sibling warmth, and more sibling conflict. To examine this hypothesis, the severity-comorbidity index score was used to represent severity of Tourette Syndrome and comorbid tendencies. The warmth and closeness score and the conflict score were obtained through the Sibling Relationship Questionnaire (SRQ) as indices for sibling warmth and sibling conflict, respectively. The results revealed that there was a significant negative correlation between severity of Tourette Syndrome and comorbid tendencies with warmth in the sibling relationship reported by the healthy sibling ($r = -.305$, $p<.05$). This was an indication of less intimacy, friendship, similarity and admiration between the healthy sibling and the sibling with Touertte Syndrome as the Tourette Syndrome and comorbid tendencies became more severe. The results revealed that there was no significant relationship between severity of Tourette Syndrome including comorbid tendencies with conflict in the sibling relationship as reported by the healthy sibling ($r = .125$). Therefore, the obtained results partly supported hypothesis 1.2,

indicating that healthy children who had siblings with more severe Tourette Syndrome and comorbid tendencies reported less warmth and closeness between themselves and their sibling with Tourette Syndrome, but not more conflict. Therefore, the results of the correlation analysis supported hypothesis 1.2 for sibling warmth but not sibling conflict.

Relationship between TS Severity including Comorbidity with Family Relationship. It was hypothesized that more severe Tourette Syndrome including comorbid tendencies would be associated with less family cohesion and adaptability. To examine this hypothesis, the severity-comorbidity index score was used to represent severity of Tourette Syndrome and comorbid tendencies. The cohesion and adaptability scores were obtained through the Family Adaptability and Cohesion Evaluation Scales (FACES-II). The correlations did not show a relationship between severity of Tourette Syndrome and comorbid tendencies with family cohesion ($r = -.238$) and adaptability ($r = -.169$) as reported by the healthy siblings. The results did not support hypothesis 1.2 for association between severity of Tourette Syndrome and comorbid tendencies with family cohesion and adaptability.

Relationship between TS Severity including Comorbidity with Maternal Differential Treatment. It was hypothesized that more severe Tourette Syndrome including comorbid tendencies would be associated with stronger perception of maternal differential treatment. To examine this hypothesis, the severity-comorbidity index score was used to represent severity of Tourette Syndrome and comorbid tendencies. The maternal differential treatment score was obtained through the Sibling Inventory of Differential Experience (SIDE). The scores for maternal differential treatment in areas of chores, affection, control and time were standardized, and the sum of the standardized z-scores was used as an index score for maternal differential treatment. The result of the correlation revealed that there was no significant relationship

between the severity of Tourette Syndrome comorbid tendencies with perceived maternal differential treatment as reported by the healthy siblings (r = -.117). Therefore, the results of the analysis did not support hypothesis 1.3 regarding the relationship between severity of Tourette Syndrome and comorbid tendencies and maternal differential treatment.

Relationship between TS Severity including Comorbidity with Fairness Evaluation. It was hypothesized that more severe Tourette Syndrome including comorbid tendencies would be associated with stronger perception of unfairness of maternal differential treatment. To examine this hypothesis, the severity-comorbidity index score was used to represent severity of Tourette Syndrome and comorbid tendencies. The fairness evaluation of maternal differential treatment was obtained through the Sibling Inventory of Differential Experience (SIDE). The scores for fairness evaluation of maternal differential treatment in areas of chores, affection, control and time were standardized, and the sum of the standardized z-scores was used as an index score for fairness evaluation of maternal differential treatment. The results revealed that there was no significant relationship between severity of Tourette Syndrome and comorbid tendencies with fairness evaluation of maternal differential treatment (r = .092). Therefore, the results of the analysis did not support hypothesis 1.3 regarding the relationship between severity of Tourette Syndrome and comorbid tendencies with fairness evaluation of maternal differential treatment.

Relationship between TS Severity including Comorbidity with Communication. It was hypothesized that more severe Tourette Syndrome including comorbid tendencies would be associated with less communication between the parents and the healthy siblings. To examine this hypothesis, the severity-comorbidity index score was used to represent severity of Tourette Syndrome and comorbid tendencies. The communication score was obtained through the communication questionnaire, by summing the standardized scores for 2 items that were highly

correlated; these items were knowledge about Tourette Syndrome and constructive discussion between the parents and the healthy sibling regarding the sibling's Tourette Syndrome as rated by the healthy siblings. The correlation between the severity of Tourette Syndrome and comorbid tendencies with communication was significant ($r = -.420$, $p<.01$). The results revealed that when the sibling had more severe Tourette Syndrome including comorbid tendencies, the healthy siblings were less knowledgeable about their siblings' Tourette Syndrome and they had less constructive discussions with their parents regarding their siblings' Tourette Syndrome. Therefore the results supported hypothesis 1.4.

Maternal Differential Treatment and Fairness Evaluation

Relationship between Maternal Differential Treatment and Sibling Relationship. It was hypothesized that stronger perception of maternal differential treatment would be associated with less sibling warmth and more sibling conflict. The maternal differential treatment score was obtained through the Sibling Inventory of Differential Experience (SIDE) as rated by the healthy siblings. The warmth and conflict scores were obtained through the Sibling Relationship Questionnaire (SRQ) as rated by the healthy siblings. The results of the correlation revealed that there was no significant relationship between maternal differential treatment and warmth in sibling relationship as reported by the healthy sibling ($r =-.076$). The results of the correlation also revealed that there was no significant relationship between maternal differential treatment and sibling conflict as reported by the healthy sibling ($r = .182$).Therefore, the results did not support hypothesis 2.1 regarding relationship between maternal differential treatment and sibling relationship.

In their study of German subjects in their middle adulthood, Boll and his colleagues (2003) showed a quadratic relationship in which the quality of the sibling relationship was most positive and least negative when both siblings were treated equally by their parents, and the quality of the sibling relationship was most negative and least positive with perceived favoritism and disfavoritism. To examine the possibility of a curvilinear relationship between maternal differential treatment and sibling relationship using multiple regression, maternal differential treatment was entered as a linear component in the first step, and its quadratic component was used in the second step of the analysis. The results did not support the curvilinear relationship between maternal differential treatment and sibling relationship (see Table 7).

Table 7

Regression Analysis for the Quadratic Relationship between Maternal Differential Treatment and Sibling Relationship

	Warmth		Conflict	
Maternal Differential Treatment	Step1	Step2	Step1	Step2
Constant	3.026	3.051	3.40	3.372
Linear Component	-0.024	-0.016	0.061	0.052
Quadratic Component		-0.003		0.004
R^2	0.006	0.007	0.033	0.034
ΔR^2	0.006	0.001	0.033	0.001
MSerror(df)	0.702(53)	0.714(52)	0.793(53)	0.807(52)

Relationship between Maternal Differential Treatment and Family Relationship. It was hypothesized that stronger perception of maternal differential treatment would be associated with less cohesion and adaptability in the family. The maternal differential treatment score was obtained through the Sibling Inventory of Differential Experience (SIDE). The cohesion and adaptability scores were obtained through the Family Adaptability and Cohesion Evaluation Scale (FACES-II). The results of the analysis revealed that there was a significant correlation between maternal differential treatment index and family cohesion ($r = -.294$, $p<.05$). The more the healthy siblings reported being treated differently by their mothers, the less cohesion they reported in their families.

The results of the analysis indicated a significant correlation between maternal differential treatment index and family adaptability ($r = -.371$, $p<.01$). In families in which the mothers treated their child with Tourette Syndrome differently than their healthy child, the healthy siblings reported less family adaptability including less flexibility in the family in response to stress and more rigid rules, responsibilities and discipline. Therefore, the results of the analyses supported hypothesis 2.1 regarding the association between maternal differential treatment and cohesion and adaptability in the family.

Relationship between Fairness Evaluation and Sibling Relationship. It was hypothesized that stronger perception of unfairness of maternal differential treatment would be associated with less sibling warmth and more sibling conflict. The fairness evaluation score was obtained through the Sibling Inventory of Differential Experience (SIDE). The warmth and conflict scores were obtained through the Sibling Relationship Questionnaire (SRQ). The results of the analysis revealed that there was no significant correlation between fairness evaluation of maternal differential treatment and warmth in sibling relationship as reported by the healthy sibling (r = -

.240). The results revealed that there was a marginally significant relationship between fairness evaluation of maternal differential treatment and sibling conflict as reported by the healthy sibling (r = .263, *p*=.052). Healthy siblings who evaluated their mothers' differential treatment as unfair reported more conflict with their sibling with Tourette Syndrome. Therefore, the results did not support hypothesis 2.2 regarding sibling warmth, and provided only limited support for hypothesis 2.2 regarding sibling conflict.

Relationship between Fairness Evaluation and Family Relationship. It was hypothesized that stronger perception of unfairness of maternal differential treatment would be associated with less family cohesion and adaptability. The fairness evaluation score was obtained through the Sibling Inventory of Differential Experience (SIDE). The family cohesion and adaptability scores were obtained through the Family Adaptability and Cohesion Evaluation Scale (FACES-II). The results of the analysis did not show a significant relationship between fairness evaluation of maternal differential treatment and family cohesion (r = -.168) and adaptability (r = -.204). Therefore, the results did not support hypothesis 2.2 for family cohesion and adaptability.

Interaction between Fairness Evaluation and Maternal Differential Treatment

Predicting Sibling Relationship. Kowal and Kramer (1997) had shown that children's attributions about the fairness and unfairness of parental differential treatment can moderate the outcome of parental differential treatment and the quality of the sibling relationship. Therefore, it was hypothesized that fairness evaluation of maternal differential treatment would moderate the effect of maternal differential treatment on sibling warmth and conflict. The maternal differential treatment index and fairness evaluation of maternal differential treatment index were used in the analysis to examine this proposition. The interaction between maternal differential treatment and fairness evaluation of maternal differential treatment in predicting warmth and conflict in sibling

relationship was examined. The results of the regression analyses revealed that there was a significant interaction between maternal differential treatment and fairness evaluation of maternal differential treatment in predicting warmth in sibling relationships (see Table 8). The regression analyses revealed that there was no significant interaction between maternal differential treatment and fairness evaluation of maternal differential treatment in predicting sibling conflict (see Table 8).

Table 8

Regression Analysis for Interaction of Maternal Differential Treatment and Fairness Evaluation in Predicting Sibling Relationship

	Warmth			Conflict		
Effect	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Constant	3.026	3.026	3.193	3.400	3.400	3.337
Fairness Evaluation	-0.066	-0.073	-0.084*	0.078†	0.068	0.072
Maternal Differential Treatment		0.017	0.095		0.024	-0.006
Fairness Evaluation X Maternal Differential Treatment			-0.043**			0.016
R^2	0.057	0.060	0.180	0.069	0.073	0.088
ΔR^2	0.057	0.002	0.120	0.069	0.004	0.015
MS_{error}(df)	0.67(53)	0.68(52)	0.60(51)	0.77(53)	0.78(52)	0.78(51)

* $p < .05$. † $p = .052$

The significant interaction (see Figure1) indicated that when the sibling with Tourette Syndrome was favored, the healthy siblings reported more sibling warmth when they perceived the favouritism (maternal differential treatment) to be fair; however, when they perceived the favouritism to be unfair, they reported less sibling warmth. The warmth in sibling relationships was independent of fairness evaluation of maternal differential treatment when the healthy sibling was favored. The results supported Kowal and Kramer's results in respect to sibling warmth. Therefore, hypothesis 2.3 was supported for sibling warmth but not sibling conflict.

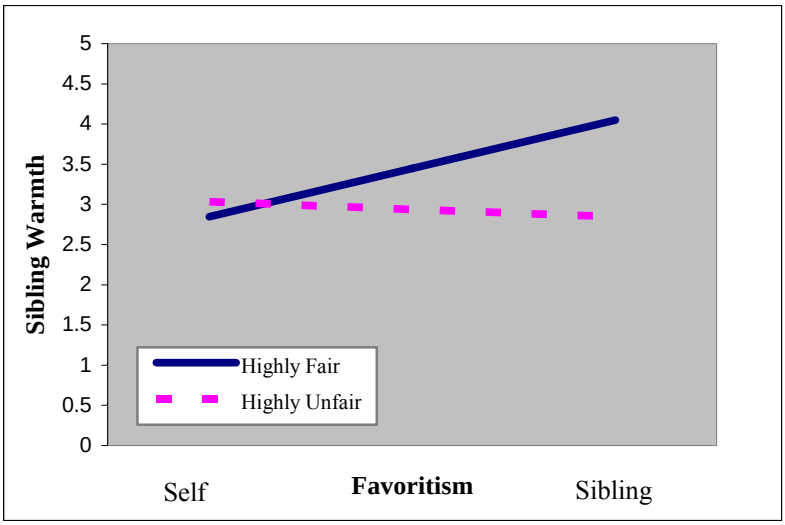

Figure 1. Interaction between fairness evaluation and maternal differential treatment (favoritism) in predicting warmth in sibling relationship

Predicting Family Relationship. It was hypothesized that the fairness evaluation of maternal differential treatment would moderate the effect of maternal differential treatment on family cohesion and adaptability. The interaction between maternal differential treatment and fairness evaluation of maternal differential treatment in predicting cohesion and adaptability in family relationship was examined. The results of the regression analyses revealed that the interactions between maternal differential treatment and fairness evaluation of maternal

differential treatment in predicting cohesion and adaptability in family relationship were not significant (see Table 9). Therefore, hypothesis 2.3 for family cohesion and adaptability was not supported.

Table 9

Regression Analysis for Interaction of Maternal Differential Treatment and Fairness Evaluation in Predicting Family Relationship

	Cohesion			Adaptability		
Effect	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Constant	15.039	15.039	15.691	30.507	30.507	31.435
Fiarness Evaluation	-0.371	-0.074	-0.117	-0.528	-0.082	-0.142
Maternal Differential Treatment		-0.691	-0.383		-1.042*	-0.604
Fairness Evaluation X Maternal Differential Treatment			-0.170			-0.241
R^2	0.028	0.087	0.116	0.042	0.138	0.180
ΔR^2	0.028	0.059	0.029	0.042	0.097	0.042
MS_{error}(df)	43.79(53)	41.92(52)	41.39(51)	60.01(53)	54.99(52)	53.33(51)

* $p < .05$.

Interaction between TS Severity including Comorbidity and Fairness Evaluation

Predicting Sibling Relationship. It was hypothesized that the fairness evaluation of maternal differential treatment would moderate the effect of severity of Tourette Syndrome including comorbid tendencies on sibling warmth and conflict. The results indicated that the

interaction between fairness evaluation of maternal differential treatment and severity of Tourette Syndrome including comorbid tendencies in predicting warmth in sibling relationship was significant (see Table 10).

Table 10

Regression Analysis for Interaction of Fairness Evaluation and Severity in Predicting Sibling Relationship

	Warmth			Conflict		
Effect	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Constant	3.007	3.007	2.989	3.404	3.404	3.421
Fairness Evaluation	-0.064	-0.057	-0.065	0.078†	0.075	0.081*
Severity		-0.076*	-0.057		0.030	0.012
Severity X Fairness Evaluation			0.022*			-0.021
R^2	0.056	0.137	0.206	0.069	0.079	0.129
ΔR^2	0.056	0.081	0.068	0.069	0.010	0.050
MS_{error}(df)	0.66(52)	0.61(51)	0.58(50)	0.78(52)	0.78(51)	0.76(50)

* $p < .05$. † $p = .055$.

The significant interaction (see Figure 2) indicated that when the sibling had less severe Tourette Syndrome including comorbid tendencies, the healthy siblings reported more warmth in their relationship with their sibling with Tourette Syndrome only when they perceived maternal differential treatment as fair; however, when they perceived the maternal differential treatment as unfair they reported less warmth in their relationship with their sibling with Tourette Syndrome.

When the sibling with Tourette Syndrome had more severe Tourette Syndrome including comorbid tendencies, the warmth between the healthy sibling and sibling with Tourette Syndrome was independent of fairness evaluation of maternal differential treatment.

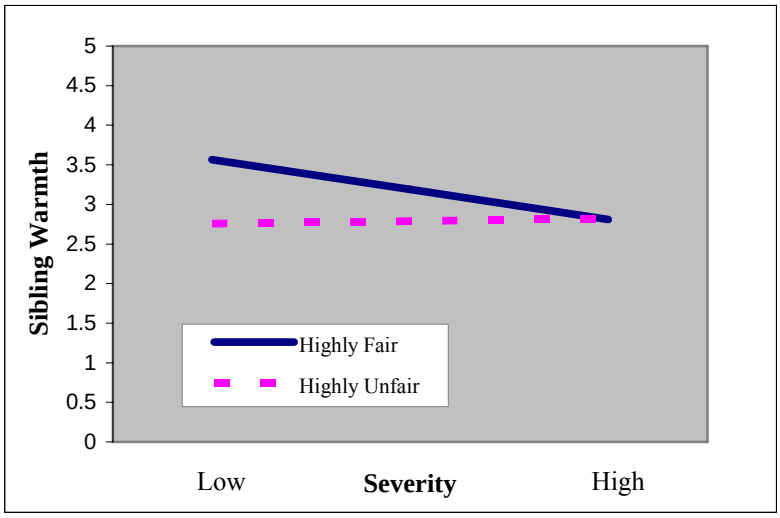

Figure 2. Interaction between fairness evaluation of maternal differential treatment and severity of Tourette Syndrome including comorbid tendencies in predicting warmth in sibling relationship

The interaction between fairness evaluation of maternal differential treatment and severity of Tourette Syndrome including comorbid tendencies in predicting sibling conflict was not significant (see Table 10). Therefore, the results supported hypothesis 2.4 for sibling warmth but not sibling conflict.

Predicting Family Relationship. It was hypothesized that the fairness evaluation of maternal differential treatment would moderate the effect of severity of Tourette Syndrome including comorbid tendencies on family cohesion and adaptability. The results of the regression analyses revealed that there was no significant interaction between fairness evaluation of maternal differential treatment and severity of Tourette Syndrome including comorbid tendencies

in predicting family cohesion and adaptability (see Table 11). Therefore, the results of the regression analyses did not support hypothesis 2.4 for family cohesion and adaptability.

Table 11

Regression Analysis for Interaction of Fairness Evaluation and Severity in Predicting Family Relationship

	Cohesion			Adaptability		
Effect	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Constant	14.965	14.964	15.057	30.408	30.408	30.500
Fairness Evaluation	-0.364	-0.319	-0.286	-0.519	-0.483	-0.451
Severity		-0.483	-0.575		-0.384	-0.476
Interaction of Severity & Fairness Evaluation			-0.109			-0.108
R^2	0.028	0.077	0.103	0.040	0.063	0.081
ΔR^2	0.028	0.050	0.025	0.040	0.023	0.018
$MS_{error}(df)$	44.32(52)	42.87(51)	42.53(50)	60.61(52)	60.33(51)	60.36(50)

Communication

Relationship between Communication and Sibling Relationship. It was hypothesized that communication regarding Tourette Syndrome between the healthy child and the parents would be associated with more sibling warmth and less sibling conflict. The communication score was obtained through the communication questionnaire, by summing the standardized scores for two items that were highly correlated. These items were knowledge about Tourette Syndrome and

constructive discussion between the parents and the healthy sibling regarding the sibling's Tourette Syndrome. Warmth and conflict scores were obtained through the Sibling Relationship Questionnaire (SRQ). The results of the correlation revealed that there was a significant relationship between communication and sibling warmth ($r = .347$, $p<.05$). The results revealed that healthy siblings who were more knowledgeable about Tourette Syndrome and had more constructive discussions about it reported more warmth and closeness in their relationship with their sibling with Tourette Syndrome. The result of the correlation revealed that the relationship between communication and sibling conflict was not significant ($r = -.058$). Therefore the result of the analyses supported hypothesis 3.1 regarding sibling warmth but not sibling conflict.

Relationship between Communication and Family Relationship. It was hypothesized that communication regarding Tourette Syndrome between the healthy sibling and the parents would be associated with more family cohesion and adaptability. The communication score was obtained through the communication questionnaire. Family cohesion and adaptability scores were obtained through the Family Adaptability and Cohesion Evaluation Scale (FACES-II).The results revealed that there was a significant relationship between communication and family cohesion ($r = .422$, $p<.01$). Healthy siblings, who were more knowledgeable about Tourette Syndrome and had more constructive discussions regarding their sibling's Tourette Syndrome with their parents, reported more cohesion in their families, which entailed stronger emotional bonding and connection among the family members. The results revealed a significant relationship between communication and family adaptability ($r = .410$, $p<.01$). Siblings who were more knowledgeable about Tourette Syndrome and had more constructive discussions regarding their sibling's Tourette Syndrome with their parents reported more adaptability in their

families, which entailed being more resilient and flexible in coping. Therefore, the results supported hypothesis 3.1 for family cohesion and adaptability.

Relationship between Communication and Maternal Differential Treatment. It was hypothesized that less communication regarding Tourette Syndrome between the healthy child and the parents would be associated with stronger perception of maternal differential treatment. The communication score was obtained through the communication questionnaire, and the maternal differential treatment score was obtained through the Sibling Inventory of Differential Experience (SIDE). The result of the correlation revealed that the relationship between communication and maternal differential treatment was not significant ($r = -.223$). Therefore, hypothesis 3.2 for maternal differential treatment was not supported.

Relationship between Communication and Fairness Evaluation. It was hypothesized that less communication regarding Tourette Syndrome between the healthy child and the parents would be associated with stronger perception of unfairness of maternal differential treatment. The communication score was obtained through the communication questionnaire, and the fairness evaluation score was obtained through the Sibling Inventory of Differential Experience (SIDE). The result of the analysis revealed that the relationship between communication and fairness evaluation of maternal differential treatment was not significant ($r = -.176$). Therefore, hypothesis 3.2 for fairness evaluation of maternal differential treatment was not supported.

Interaction between Communication and TS Severity including Comorbidity

Predicting Sibling Relationship. It was hypothesized that effective communication about Tourette Syndrome between the healthy sibling and the parents would moderate the effect of severity of Tourette Syndrome including comorbid tendencies on sibling warmth and conflict. The results of the regression analyses revealed that the interactions between communication and

severity of Tourette Syndrome in predicting sibling warmth and conflict were not significant (see Table 12). Therefore, the results of the analysis did not support hypothesis 3.3 regarding sibling warmth and conflict.

Table 12

Regression Analysis for Interaction of Communication and Tourette Syndrome Severity and Comorbidity in Predicting Sibling Relationship

	Warmth			Conflict		
Effect	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Constant	2.983	2.999	2.886	3.390	3.378	3.374
Communication	0.156*	0.114	0.171*	-0.027	0.004	0.006
Severity		-0.058	-0.040		0.043	0.044
Communication X Severity			-0.050			-0.002
R^2	0.102	0.137	0.183	0.003	0.018	0.018
ΔR^2	0.102	0.035	0.046	0.003	0.016	0.000
MS_{error}(df)	0.674(45)	0.663(44)	0.642(43)	0.922(45)	0.928(44)	0.950(43)

* $p < .05$.

Predicting Family Relationship. It was hypothesized that effective communication about Tourette Syndrome between the healthy sibling and the parents would moderate the effect of severity of Tourette Syndrome including comorbid tendencies on family cohesion and adaptability. The results of the regression analysis revealed that the interaction between

communication and severity of Tourette Syndrome in predicting family cohesion was not significant (see Table 13). However, there was a significant interaction between communication and severity of Tourette Syndrome and comorbid tendencies in predicting family adaptability (see Table 13).

Table 13

Regression Analysis for Interaction of Communication and Tourette Syndrome Severity and Comorbidity in Predicting Family Relationship

	Cohesion			Adaptability		
Effect	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Constant	15.258	15.341	14.637	30.443	30.450	28.817
Communication	1.663**	1.445*	1.802*	1.858**	1.841*	2.668**
Severity		-0.299	-0.187		-0.023	0.236
Communication X Severity			-0.310			-0.718*
R^2	0.172	0.185	0.212	0.159	0.159	0.264
ΔR^2	0.172	0.014	0.026	0.159	0.000	0.105
MS_{error}(df)	42.31(45)	42.55(44)	42.13(43)	57.92(45)	59.23(44)	53.02(43)

** p <.01. * p < .05.

The result of the regression analysis revealed that when the sibling had less severe Tourette Syndrome including comorbid tendencies, the healthy siblings reported more family adaptability when they had more communication with their parents, and reported less family

adaptability when they had less communication with their parents (see Figure 3). However, the result of the regression analysis revealed that when the sibling had more severe Tourette Syndrome including comorbid tendencies the healthy siblings reported similar levels of family adaptability regardless of their communication with their parents (see Figure 3). Therefore the results of the analysis supported hypothesis 3.3 regarding family adaptability but not family cohesion.

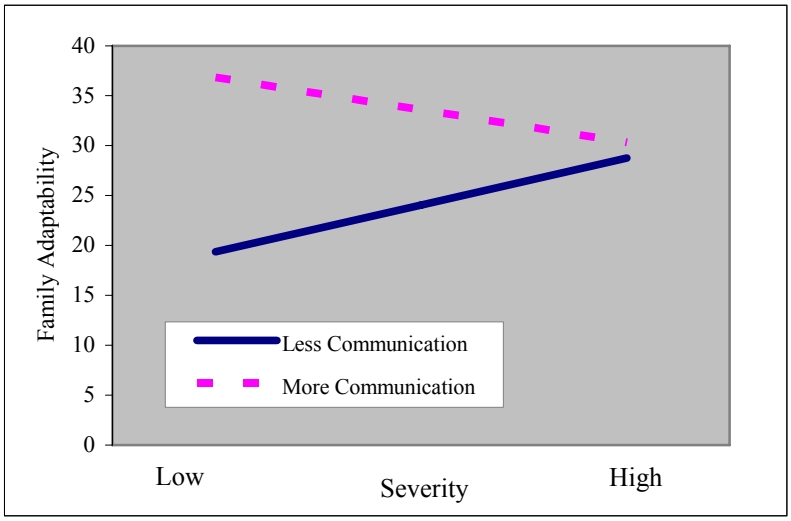

Figure 3. Interaction between communication and severity of Tourette Syndrome including comorbid tendencies in predicting family adaptability

Interaction between Communication and Fairness Evaluation

Predicting Sibling Relationship. It was hypothesized that effective communication about Tourette Syndrome between the healthy sibling and the parents would moderate the effect of fairness evaluation of maternal differential treatment on sibling warmth and conflict. The results of the regression analyses revealed that the interactions between communication and fairness evaluation of maternal differential treatment in predicting sibling warmth and conflict were not

significant (see Table 14). Therefore, the results of the analysis did not support hypothesis 3.4 regarding sibling warmth and conflict.

Table 14

Regression Analysis for Interaction of Communication and Fairness Evaluation in Predicting Sibling Relationship

	Warmth			Conflict		
Effect	Step1	Step2	Step3	Step1	Step2	Step3
Constant	2.998	2.997	3.027	3.386	3.387	3.398
Communication	0.168*	0.152*	0.149*	-0.031	-0.006	-0.008
Fairness Evaluation		-0.051	-0.041		0.076	0.080
Communication X Fairness Evaluation			0.029			0.011
R^2	0.121	0.156	0.189	0.003	0.069	0.073
ΔR^2	0.121	0.035	0.034	0.003	0.065	0.004
MS_{error}(df)	0.67(46)	0.66(45)	0.646(44)	0.90(46)	0.87(45)	0.88(44)

* $p < .05$.

Predicting Family Relationship. It was hypothesized that effective communication about Tourette Syndrome between the healthy sibling and the parents would moderate the effect of fairness evaluation of maternal differential treatment on family cohesion and adaptability. The results of the regression analyses revealed that the interaction between communication and fairness evaluation in predicting family cohesion was significant (see table15).

Table 15

Regression Analysis for Interaction of Communication and Fairness Evaluation in Predicting Family Relationship

	Cohesion			Adaptability		
Effect	Step1	Step2	Step3	Step1	Step2	Step3
Constant	15.252	15.250	15.607	30.462	30.460	30.800
Communication	1.657**	1.591**	1.557**	1.874**	1.761**	1.728**
Fairness Evaluation		-0.208	-0.080		-3.356	-0.255
Communication X Fairness Evaluation			0.360*			0.344
R^2	0.178	0.187	0.263	0.168	0.187	0.238
ΔR^2	0.178	0.009	0.076	0.168	0.019	0.052
MS_{error}(df)	41.39(46)	41.86(45)	38.78(44)	56.68(46)	56.60(45)	54.22(44)

** $p < .01$. * $p < .05$.

The results indicated that when healthy siblings perceived their maternal differential treatment to be unfair, they reported more family cohesion when they had more communication with their parents, and reported less family cohesion when they had less communication with their parents. When the healthy siblings perceived maternal differential treatment to be fair, they reported similar levels of family cohesion regardless of the amount of their communication with their parents (see Figure 4). The results did not show a significant interaction between

communication and fairness evaluation in predicting family adaptability. Therefore the results supported hypothesis 3.4 regarding family cohesion but not family adaptability.

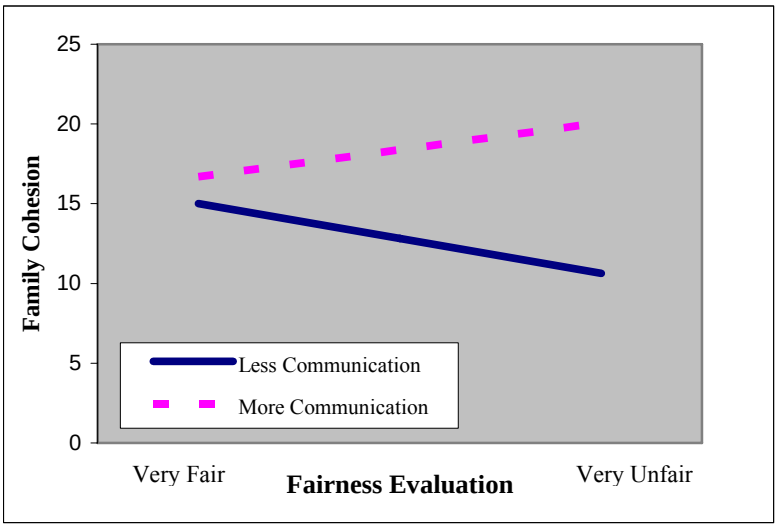

Figure 4. Interaction between communication and fairness evaluation in predicting family cohesion

Interaction between Communication and Maternal Differential Treatment

It was hypothesized that effective communication about Tourette Syndrome between the healthy sibling and the parents would moderate the effect of maternal differential treatment on fairness evaluation of maternal differential treatment. The result of the regression analysis revealed that the interaction between communication and maternal differential treatment in predicting fairness evaluation was not significant (see Table 16). Therefore, hypothesis 3.5 was not supported.

Table 16

Regression Analysis for Interaction of Communication and Maternal Differential Treatment in Predicting Fairness Evaluation

	Fairness Evaluation of Maternal Differential Treatment		
Effect	Step1	Step2	Step3
Constant	0.012	-0.026	-0.084
Communication	-0.316	-0.122	-0.140
Maternal Differential Treatment		0.546*	0.511*
Communication X Maternal Differential Treatment			-0.055
R^2	0.031	0.221	0.211
ΔR^2	0.031	0.223	0.007
$MS_{error}(df)$	10.22(46)	8.05(45)	8.15(44)

* $p < .05$.

Age

Interaction between Age and Communication

Predicting Sibling Relationship. It was hypothesized that age differences can moderate the effect of communication on sibling warmth and conflict. The results of the regression analysis revealed both a significant effect of age on sibling conflict, and a significant interaction between age and communication in predicting both sibling warmth and sibling conflict (see Table 17).

Table 17

Regression Analysis for Interaction of Age and Communication in Predicting Sibling Relationship

	Warmth			Conflict		
Effect	Step1	Step2	Step3	Step1	Step2	Step3
Constant	3.006	3.001	2.986	3.483	3.484	3.500
Age	0.032	0.027	0.007	-0.117**	-0.116**	-0.095*
Communication		0.148*	0.179*		-0.027	-0.061
Age X Communication			0.059*			-0.064*
R^2	0.012	0.104	0.200	0.149	0.152	0.261
ΔR^2	0.012	0.092	0.096	0.149	0.003	0.109
MS_{error}(df)	0.75(44)	0.69(43)	0.63(42)	0.67(44)	0.69(43)	0.61(42)

** $p < .01$.* $p < .05$.

The significant interaction between age and communication (see Figure 5), showed that older healthy siblings who engaged in less communication with their parents reported less warmth with their sibling with Tourette Syndrome; whereas, older healthy siblings who engaged in more communication with their parents reported more warmth with their sibling with Tourette Syndrome. Warmth and closeness between the younger healthy siblings and their sibling with Tourette Syndrome was independent of their communication with their parents.

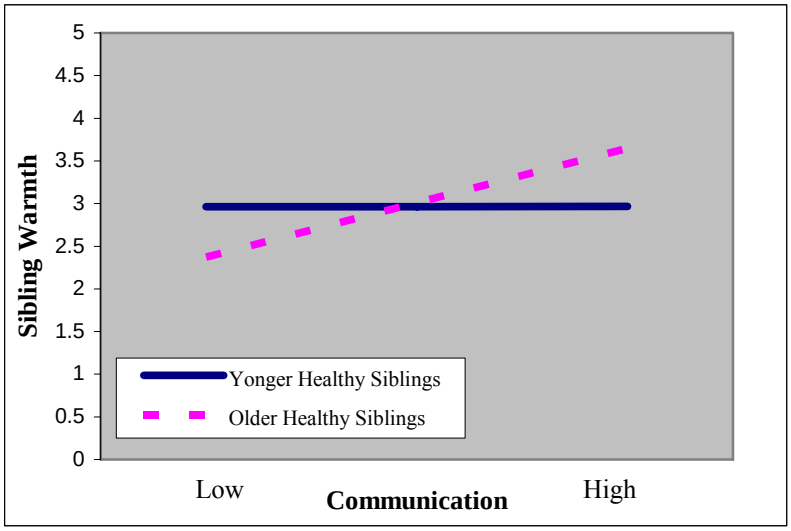

Figure 5. Interaction between age and communication in predicting sibling warmth

The main effect of age showed that as healthy siblings became older, they reported less conflict with their sibling with Tourette Syndrome (see Table 17). The significant interaction between age and communication (see Figure 6), showed that when healthy siblings had more communication with their parents they reported more conflict with their sibling with Tourette Syndrome when they were younger, and reported less sibling conflict with their sibling with Tourette Syndrome when they were older. When healthy siblings had limited conversation with their parents, sibling conflict was independent of their age. Therefore, hypothesis 4.1 was supported for sibling warmth and conflict.

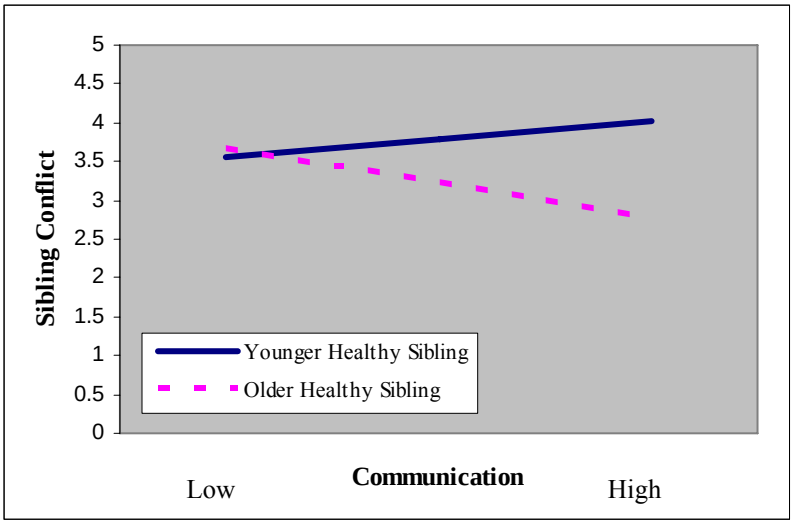

Figure 6. Interaction between age and communication in predicting sibling conflict

Predicting Family Relationship. It was hypothesized that age differences may moderate the effect of communication on family cohesion and adaptability. The result of the analysis did not show any significant interaction between age and communication in predicting family cohesion and adaptability (see Table 18). Therefore, hypothesis 4.1 was not supported for family cohesion and adaptability.

Table 18

Regression Analysis for Interaction of Age and Communication in Predicting Family Relationship

	Cohesion			Adaptability		
Effect	Step1	Step2	Step3	Step1	Step2	Step3
Constant	15.687	15.636	15.583	30.777	30.722	30.622
Age	0.056	0.002	-0.066	0.387	0.329	0.198
Communication		-1.485**	-1.591**		1.610*	1.813**
Age X Communication			0.202			0.385
R^2	0.001	0.152	0.171	0.020	0.149	0.198
ΔR^2	0.001	0.152	0.018	0.020	0.129	0.048
MS_{error}(df)	46.47(44)	40.33(43)	40.40(42)	62.83(44)	55.80(43)	53.88(42)

** $p < .01$.* $p < .05$.

Interaction between Age and Maternal Differential Treatment

Predicting Sibling Relationship. It was hypothesized that age differences may moderate the effect of maternal differential treatment on sibling warmth and conflict. The regression analysis did not reveal a significant interaction between age and maternal differential treatment in predicting warmth (see Table 19). However, the analysis showed both a significant main effect of age and a significant interaction between age and maternal differential treatment in predicting sibling conflict (see Table 19).

Table 19

Regression Analysis for Interaction of Age and Maternal Differential Treatment in Predicting Sibling Relationship

	Warmth			Conflict		
Effect	Step1	Step2	Step3	Step1	Step2	Step3
Constant	3.029	3.031	3.034	3.473	3.469	3.456
Age	0.027	0.028	0.027	-0.085**	-0.087**	-0.080**
Maternal Differential Treatment		-0.026	-.024		0.048	0.038
Age X Maternal Differential Treatment			-0.008			0.041*
R^2	0.010	0.017	0.020	0.093	0.117	0.192
ΔR^2	0.010	0.007	0.003	0.093	0.024	0.075
MS_{error}(df)	0.70(50)	0.71(49)	0.72(48)	0.66(50)	0.65(49)	0.61(48)

** $p < .01$. * $p < .05$.

The significant interaction between age and maternal differential treatment in predicting sibling conflict (see Figure 7) showed that when healthy siblings were favored by their mothers, they reported more conflict with their sibling with Tourette Syndrome when they were younger than when they were older. When the sibling with Tourette Syndrome was favored by the mother, the healthy siblings reported the same level of sibling conflict with their sibling with Tourette Syndrome regardless of their age. Therefore, hypothesis 4.2 was supported for sibling conflict but not sibling warmth.

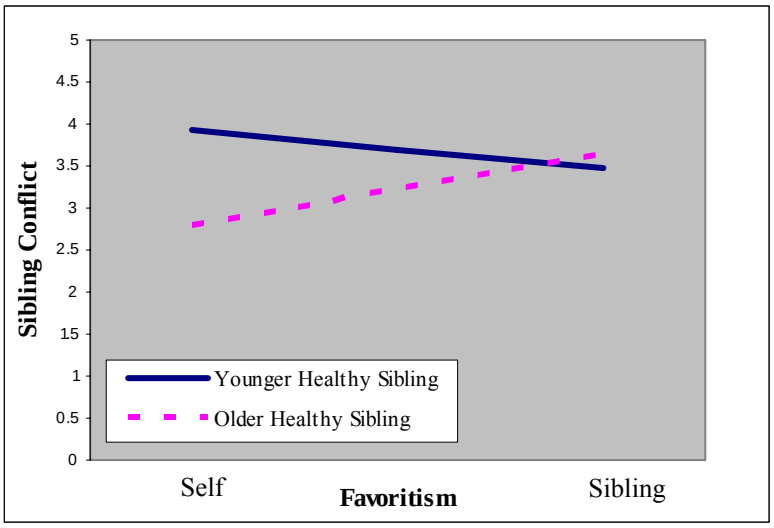

Figure 7. Interaction between age and maternal differential treatment in predicting conflict in sibling relationship

Predicting Family Relationship. It was hypothesized that age differences can moderate the effect of maternal differential treatment on family cohesion and adaptability. The regression analysis did not reveal a significant interaction between healthy siblings' age and maternal differential treatment in predicting family cohesion and adaptability (see Table 20). Therefore, hypothesis 4.2 was not supported for family cohesion and adaptability.

Table 20

Regression Analysis for Interaction of Age and Maternal Differential Treatment in Predicting Family Relationship

	Cohesion			Adaptability		
Effect	Step1	Step2	Step3	Step1	Step2	Step3
Constant	15.426	15.509	15.528	30.805	30.923	30.976
Age	0.013	0.044	0.035	0.190	0.234	0.207
Maternal Differential Treatment		-0.848**	-0.832**		-1.198**	-1.155**
Age X Maternal Differential Treatment			-0.064			-0.174
R^2	0.000	0.127	0.130	0.006	0.186	0.202
ΔR^2	0.000	0.127	0.003	0.006	0.180	0.016
MS_{error}(df)	42.58(50)	37.93(49)	38.58(48)	59.68(50)	49.87(49)	49.89(48)

** $p < .01$. * $p < .05$.

Interaction between Age and Fairness Evaluation

Predicting Sibling Relationship. It was hypothesized that age differences may moderate the effect of fairness evaluation of maternal differential treatment on sibling warmth and conflict. The results of the regression analysis revealed that the interaction between age and fairness evaluation of maternal differential treatment in predicting warmth and conflict between the healthy siblings and their sibling with Tourette Syndrome was not significant (see Table 21). However, an interesting finding was that fairness evaluation predicted sibling conflict when the

effect of age was controlled. The more the healthy siblings perceived their mothers' differential treatment as unfair, the more conflict they reported with their sibling with Tourette Syndrome. The hypothesis 4.3 for sibling warmth and conflict was not supported.

Table 21

Regression Analysis for Interaction of Age and Fairness Evaluation of Maternal Differential Treatment in Predicting Sibling Relationship

	Warmth			Conflict		
Effect	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Constant	3.029	3.022	3.022	3.473	3.483	3.483
Age	0.027	0.026	0.013	-0.085*	-0.084*	-0.088*
Fairness Evaluation		-0.067	-0.061		-0.094*	-0.096*
Age X Fairness Evaluation			-0.008			-0.002
R^2	0.010	0.070	0.077	0.093	0.210	0.211
ΔR^2	0.010	0.061	0.007	0.093	0.118	0.001
MS_{error}(df)	0.70(50)	0.67(49)	0.68(48)	0.66(50)	0.58(49)	0.60(48)

* $p < .05$.

Predicting Family Relationship. It was hypothesized that age differences can moderate the effect of fairness evaluation of maternal differential treatment on family cohesion and adaptability. The results of the regression analysis revealed that the interaction between age and

fairness evaluation of maternal differential treatment in predicting cohesion and adaptability in the family was not significant (see Table 22). Therefore, hypothesis 4.3 for family cohesion and adaptability was not supported.

Table 22

Regression Analysis for Interaction of Age and Fairness Evaluation of Maternal Differential Treatment in Predicting Family Relationship

	Cohesion			Adaptability		
Effect	Step1	Step2	Step3	Step1	Step2	Step3
Constant	15.426	15.395	15.388	30.805	30.756	30.748
Age	0.013	0.010	-0.295	0.190	0.184	-0.173
Fairness Evaluation		-0.299	-0.158		-0.476	-0.311*
Age X Fairness Evaluation			-0.184			-0.215
R^2	0.000	0.020	0.082	0.006	0.042	0.102
ΔR^2	0.000	0.020	0.062	0.006	0.036	0.060
MS_{error}(df)	42.58(50)	42.57(49)	40.72(48)	59.68(50)	58.66(49)	56.12(48)

* $p < .05$.

Discussion

The present study explored the effects of disorder severity, communication, maternal differential treatment, and fairness evaluation of maternal differential treatment in predicting both sibling and family relationships from the healthy siblings' perspectives. I will first discuss

variables that predicted closeness and conflict in the sibling relationships between the healthy siblings and their siblings with Tourette Syndrome. Then, I will discuss variables that predicted family cohesion and adaptability. Sibling warmth and conflict were strongly correlated ($r = -.325$, $p<.05$) and there was a significant correlation between family cohesion and adaptability ($r = -.796$, $p<.01$). Nevertheless, most of the factors that predicted closeness between the healthy siblings and their siblings with Tourette Syndrome were different than those that predicted sibling conflict. This was, to some extent, true for family cohesion and adaptability. These results suggest the importance of using various scales or measures to investigate different aspects of the sibling relationships and family dynamics. The results of the present study also highlight the importance of moderating factors such as communication, healthy siblings' judgements about fairness of maternal differential treatment and age. Ignoring the moderating factors could mislead researchers in their conclusions about existing relationships between siblings as well as among family members.

One important preliminary finding of the present study was the association between the severity of Tourette Syndrome and the severity of ADHD, OCD and rage, which supported the findings of previous studies. Stephens and Sandor (1999) suggested that aggressive behaviour in children with Tourette Syndrome is associated with ADHD and OCD, and Kurlan et al. (2002) suggested that individuals with severe tics had an increased frequency of aggressive behaviours. Spencer et al. (1998) suggested that Tourette Syndrome comorbid with ADHD was a more severe disorder than ADHD alone, and Coffey et al. (1998) suggested that Tourette Syndrome comorbid with OCD was a more severe disorder than either of the two alone. The present study was the first study of its kind to study associations among Tourette Syndrome and ADHD, OCD, and rage. Parents' ratings of the severity of Tourette Syndrome were highly associated with

severity ratings of ADHD, OCD, and rage tendencies. A child with severe Tourette Syndrome could have tics including involuntary eye blinking, facial grimacing, nose twitching, sniffing, head and shoulder jerks, punching and kicking that occur almost regularly, but not necessarily at the same time. The tics often call attention to the child because of their exaggerated and forceful or loud character. Parents had mentioned ADHD symptoms including inattentiveness, fidgeting, distractibility, and OCD symptoms including repetitive behaviours that the child often yielded to and could not stop. The amalgam of these distressing symptoms gets even more complicated with cursing, threatening, smashing objects, and attacking self or others. Therefore, the results suggest that it would be unrealistic to study Tourette Syndrome without considering the comorbid tendencies as part of the illness. It would be more pragmatic to use an inclusive approach including Tourette Syndrome and comorbid tendencies in studies of Tourette Syndrome.

Severe Tourette Syndrome appears to be quite debilitating, given that accompanying comorbid tendencies are also severe. A major purpose of the present study was to investigate how severity of Tourette Syndrome including comorbid tendencies affect sibling relationships and family processes.

Closeness in Sibling Relationship

Warmth in sibling relationships was evaluated with items that measured closeness between siblings such as intimacy, companionship, similarity and affection. Warmth and closeness between healthy siblings and their sibling with Tourette Syndrome was associated with both the severity of Tourette Syndrome and communication between the healthy siblings and their parents. Healthy siblings of children with more severe Tourette Syndrome and comorbid

tendencies felt less close to their sibling with Tourette Syndrome than those with less severe symptoms. Although there is no direct evidence in the current study, it is possible that parents of children with more severe Tourette Syndrome might be inclined to encourage separation between their healthy children and their child with Tourette Syndrome. It is also possible that healthy siblings or their siblings with Tourette Syndrome themselves might wish to avoid each other. Past studies have also reported coercive and aversive behaviours between siblings when at least one of the siblings had serious conduct problems (Slomkowski, Cohen & Brook, 1997). Studies of sibling relationships in children with physical or psychological disorders have shown that ill siblings reported less positiveness and more avoidance and detachment rather than direct sibling conflict in their sibling relationship (Robertson, Kutcher, Bird & Grasswick, 2001; Weiss, Schiaffino & Ilowite, 2001; Fox, Barrett & Shortt, 2002). Separation or avoidance, either initiated by the parents or by the siblings, could be a protective strategy to ensure the safety of the siblings and to prevent potential conflicts. Motor and vocal tics, compulsive behaviours, hyperactive actions, and rage attacks could be distressing and irritating for the whole family, and especially for the healthy sibling. In addition, a healthy sibling's reactions could also exacerbate the Tourette Syndrome (e.g., triggering tics). The absence of an association between conflict and severity supports the avoidance proposition, suggesting that healthy siblings and siblings with more severe Tourette Syndrome have fewer encounters and less interdependence; children in these families may have fewer opportunities to engage in conflict.

The fact that severity as a predictor of sibling warmth is out of the control of the siblings and the parents might seem discouraging. However, what is promising is that both communication and siblings' judgements about the fairness of maternal differential treatment, factors that are under the control of healthy siblings and their parents, also predict sibling

warmth. Past studies have shown that limited knowledge of the healthy siblings of children with cancer about their siblings' illness was associated with their reports of less warmth in their sibling relationship (Labay & Walco, 2004). It was expected that more communication regarding Tourette Syndrome would be associated with more sibling warmth. The results supported the prediction: healthy siblings who were more knowledgeable about Tourette Syndrome and engaged in more constructive discussions with their parents regarding their sibling's Tourette Syndrome felt closer to their sibling with Tourette Syndrome. Effective discussions with parents could provide the opportunity for the parents to explain the symptoms and behaviour of the child with Tourette Syndrome, their own behaviour, and to correct the misconceptions that the healthy siblings might have about their sibling's symptoms or parental behavior. The results also suggest that effective discussions with parents could provide healthy siblings with opportunities to discuss their feelings, concerns and questions with their parents. However, younger healthy siblings did not appear to benefit from their discussions as much as the older healthy siblings. Older healthy siblings who engaged in more effective discussions with their parents felt closer to their sibling with Tourette Syndrome than did older healthy siblings who had fewer discussions. In contrast, younger healthy siblings' closeness to their sibling with Tourette Syndrome was independent of the extent of their discussion with their parents.

Healthy children who had siblings with more severe Tourette Syndrome and comorbid disorders reported less communication with their parents. This might suggest that both parents and the healthy siblings could find it easier to discuss less debilitating and less complicated conditions rather than more debilitating and complicated conditions. The more promising finding was that even though the moderating effect of communication on severity in predicting warmth was not significant, communication had a mediating role between severity and warmth. This

relationship was not predicted and was a post-hoc finding of the study; yet it emphasized the importance of communication in predicting sibling warmth. The analysis showed that when communication was controlled, severity could no longer predict warmth; thus, the negative effect of severity in predicting sibling warmth depended on the accompanying lack of communication in such families. This finding also suggests the importance of finding appropriate communication strategies that address special circumstances in these families. These results emphasize the role and responsibility of the clinicians (e.g., psychologists, physicians) to consider the complexity of the illness and the significance of severity in providing parents and their children with proper and practical assistance. These considerations could help clinicians in finding strategies that could encourage rather than discourage communication between the siblings and their parents with more severe cases of Tourette Syndrome in the family.

Future studies could also explore procedures other than parent-child communication to encourage closeness between the younger healthy children and their sibling with Tourette Syndrome, such as projects that involve participation in shared activities and negotiation between the siblings. It is important to find factors that could moderate the effect of severity and age without compromising the closeness between siblings. It is also important to provide parents with age-appropriate communication strategies, so that they could encourage more closeness between their younger healthy children and their child with Tourette Syndrome.

Closeness between the healthy siblings and their sibling with Tourette Syndrome was also predicted by their judgements about the fairness of their mothers' differential treatment, which moderated both the effect of severity and maternal differential treatment on sibling warmth. When the siblings with Tourette Syndrome had less severe symptoms and were favored by their mothers, healthy siblings felt closer to their favored siblings only when they judged their

mothers' favoritism as fair. However, when they judged their mothers' favoritism towards the sibling with Tourette Syndrome as unfair, they felt less close to the favored sibling. With more severe cases of Tourette Syndrome, healthy siblings' judgements were not powerful enough to moderate the effect of severity. In these families, healthy siblings reported a similar low level of warmth with their siblings with Tourette Syndrome regardless of their judgements about the fairness or unfairness of their mothers' behaviour. More severe motor and vocal tics, compulsive behaviours, hyperactive actions, and rage attacks could be too overwhelming for the healthy siblings. Therefore their judgements about the fairness of their mothers' behaviour failed to alleviate the effect of severity.

Previous studies have shown that children's attributions about the fairness and unfairness of parental differential treatment could moderate the effect of parental differential treatment on the quality of the sibling relationship (Kowal & Kramer, 1997; Boll et al., 2005). Our results supported the moderating effect of fairness evaluations. When the sibling with Tourette Syndrome was favored, healthy siblings felt closer to the favored sibling when they perceived their mothers' preferential behaviour as fair. As Kowal and Kramer (1997) had suggested, when the siblings experience parental differential treatment, they may look for ways in which they and their preferred sibling are different. In the present study healthy siblings were asked to explain why they believed the maternal differential treatment was fair or unfair. Age, siblings' needs, sense of responsibility, sibling's behaviour, gender, and parents' expectations were among the variables that healthy siblings suggested had influenced their judgements about their mothers' differential treatment (see Appendix D). As a result, healthy siblings who were able to justify their mothers' preferential behaviour based on these grounds were able to empathize with their siblings with Tourette Syndrome and appreciate their differences with their siblings rather than

feeling resentful towards them. Another interesting finding was that when healthy siblings felt that they were preferred by their mothers, their judgment about fairness of their mothers' behaviour did not predict sibling warmth and closeness. It is possible that siblings with Tourette Syndrome might find it hard to appreciate the needs of their healthy siblings and might be unable to accept their healthy siblings' special treatment. Therefore, they might feel resentment towards their healthy siblings, which would be perceived as emotional distance by their healthy sibling even though the healthy siblings could believe that the treatment that they received was fair.

Conflict in Sibling Relationship

Items such as quarrelling, antagonism and competition signalled high levels of conflict. Children's perceptions of good communication with their parents not only was an important predictor of the warmth they reported with their sibling, but also a significant predictor of reported sibling conflict. However, the effect of communication depended on the age of the healthy siblings. In general, age was associated with sibling conflict and older healthy siblings reported less sibling conflict than younger healthy siblings. This was consistent with the results of previous studies showing that sibling conflict declines with age (Vandell & Bailey, 1992, Ross et al., 1996; McGuire, Manke, Eftekhari & Dunn, 2000). The results also showed that older healthy siblings who reported more communication with their parents benefited most from their discussions with their parents, and reported less sibling conflict. Despite their frequent communications with their parents, younger healthy siblings reported more conflict with their sibling with Tourette Syndrome. These findings suggest that parents might not be equipped with the necessary knowledge and negotiation strategies needed to communicate effectively with their younger children. Besides, older healthy siblings are more intellectually and emotionally mature;

therefore, they could be able to negotiate with their parents more successfully, get involved in decision making along with their parents, and reach compromise, without engaging in conflict with their sibling. It is also possible that younger healthy siblings might not benefit from communication as much as older healthy siblings. Because of their immaturity, the younger healthy siblings might find it more difficult to engage in discussions and to understand them.

The age of the healthy siblings was also a significant moderator of maternal differential treatment in predicting sibling conflict. For the younger siblings, favoring the healthy sibling was associated with more sibling conflict compared to favoring the sibling with Tourette Syndrome. In contrast, for the older siblings, favoring the healthy siblings was associated with less sibling conflict compared to favoring the sibling with Tourette Syndrome. The results suggest that when the healthy siblings were favored, older healthy siblings could deal with the situation in a more constructive fashion, possibly reaching a compromise or truce with their sibling with Tourette Syndrome. Because of the greater maturity, the older healthy siblings might avoid their sibling with Tourette syndrome rather than getting involved in a conflict with them.

Sibling conflict was also associated with fairness evaluation of maternal differential treatment, when the effect of age was controlled. Healthy siblings who perceived their mothers' differential treatment as unfair reported more conflict with their sibling with Tourette Syndrome.

Cohesion in the Family

A cohesive family environment is defined as a family with strong emotional bonding among family members in which the family members have strong family ties, are united, share similar interests, and spend time together (Olson, 1999). Past studies had shown that family cohesion was associated with adult siblings' reports of parental differential treatment (Brody,

Copeland, Sutton, Richardson & Guyer, 1998). Stronger perception of parental differential treatment in families was associated with lower family cohesion, higher family disengagement and higher family conflict. Therefore, it was expected that maternal differential treatment in the present study would be associated with less family cohesion. I predicted that in families where the mothers assigned more household chores to the healthy siblings, offered them less affection and time, and disciplined them more in comparison to their child with Tourette Syndrome, healthy siblings would report a less cohesive family. The results supported the association between maternal differential treatment and family cohesion. Healthy siblings who reported that their mothers favored the sibling with Tourette Syndrome, also reported less family cohesion. A cohesive family is one in which family members are united, share similar interests and spend time together; children who perceive that their parents are treating them less well than their siblings are treated, would not regard their family as unified and cohesive. Differential treatment, whether real or only as perceived by the healthy sibling, would not be conducive to regarding the family as close and cohesive. The promising finding was that children's reports of communication between the healthy siblings and their parents was associated with their perceptions of family cohesion. Constructive discussions between the parents and the healthy siblings could provide the opportunity for these family members to get together, get involved in discussions and share their experiences and concerns, therefore, reinforcing the sense of bonding and belonging among the family members. It is possible that the child with Tourette Syndrome was also involved in these discussions, enhancing the effectiveness of communication and bonding among family members. This could be a focus for future studies to investigate how families discuss Tourette Syndrome and to what extent the child with Tourette Sydrome is involved in these discussions.

Communication also moderated the effect of fairness evaluations in predicting family cohesion. The moderating effect of communication on family cohesion depended on the healthy siblings' judgements about the fairness of maternal differential treatment. The promising finding of the study that reemphasized the effect of communication was the fact that when healthy siblings believed that their mothers' differential treatment was very unfair, they felt more family bonding when they had more communication with their parents, and reported less family cohesion when they had less communication with their parents. The extent of communication between the parents and the healthy siblings did not predict family cohesion when healthy siblings believed that their mothers' differential treatment was fair. The discussions between the healthy siblings and their parents may have provided them with a sense of closeness with their parents, making them feel they were a part of the family and that they could be involved in family discussions and decision makings. At the same time parents could have the opportunity to explain their behaviour and correct possible misconceptions about their differential treatment.

Adaptability in the Family

Family adaptability is defined as the ability of the family to change its power structure, role relationships, and relationship rules in response to situational and developmental stress (Olson, Portner & Bell, 1992). In other words, family adaptability is a measure of flexibility of the family. A flexible family is one in which parents are more egalitarian and democratic rather than authoritarian and autocratic in their discipline of their children (Olson, 1999). There are flexible negotiations within the family in which family members tend to agree on the decisions made in the family (Olson, 1999). The present study predicted that in families where the mothers assigned more household chores to the healthy siblings, offered them less affection and time, and

disciplined them more in comparison to their child with Tourette Syndrome, the healthy siblings would report less family adaptability. The negative correlation between maternal differential treatment and family adaptability suggested that in these families mothers had the tendency to enforce more rigid rules and have stricter role expectations from their healthy children, which was in contrast to a flexible family environment. However, the promising finding was that when healthy siblings had the opportunity to communicate with their parents, they reported higher adaptability in the family. Discussions with parents could provide the healthy siblings with the opportunity to voice their concerns about family relationships in the face of a sibling with Tourette Syndrome; they would notice that their role in the family is recognized and that their parents acknowledge their opinions. Communication also had a significant moderating effect on severity in predicting family adaptability. In families in which siblings' Tourette Syndrome was not severe, healthy siblings who had more communication with their parents reported higher levels of family adaptability, in comparison to the healthy siblings who had less communication with the parents. In families in which siblings' Tourette Syndrome was more severe, healthy siblings' reports about family adaptability was independent of the extent of communication between the healthy siblings and their parents. There was a trend for the siblings who had less communication with their parents to report more family adaptability with more severe Tourette Syndrome. This trend contradicts other results and suggests that factors that had not been studied in this study might explain this result. Future studies could further explore this particular trend.

There was a significant correlation between family cohesion and adaptability, and some of the findings showed that the same variables predicted both family cohesion and adaptability. However, other findings showed that family cohesion and adaptability could also be predicted by different factors. The significant correlation could suggest the possibility of combining the two

factors into a single measure; however, traditionally the literature has supported using the two factors as independent measures (Griffin & D'Andrea, 1997; Greeff, 2000; Bernstein, Anderson, Hektner & Realmuto, 2000) a strategy that was adopted in the present study.

Overall, healthy siblings' perception about family cohesion and adaptability was significantly associated with their perception of maternal differential treatment and the extent of their communication with their parents. Communication predicted family cohesion when healthy siblings believed that their mothers' differential treatment was unfair. Communication also predicted family adaptability as long as the sibling had less severe Tourettte Syndrome.

Future Directions

Future studies could explore the role of communication more specifically. It would be valuable to investigate the communication patterns among the family members. Listening skills, clarity, respect and regard are among important factors in family communication (Olson, 1999) that could be further explored. It would also be important to investigate the family communication patterns developmentally across different age groups of siblings and also across different family types.

It would be important to investigate how and why factors that predicted sibling relationships were different from ones that predicted family cohesion and adaptability even though sibling relationships were part of the extended family dynamics. Future studies could also investigate the role of satisfaction in family members' evaluations of sibling and family relationships. It would be interesting to know the relationship between family members' reports of sibling and family relationship, and their satisfaction with the status quo. Are healthy siblings who report less closeness between themselves and their sibling with a chronic condition

necessarily dissatisfied with their sibling relationship? Do healthy siblings' perceptions of less family cohesion and adaptability necessarily correspond to dissatisfaction with the family relationships?

It would be important to study all the members in the family constellation if possible. To be able to obtain inputs from all family members and to study the similarities and dissimilarities in family members' perceptions of sibling and family relationships would be invaluable.

Future studies could look for measures of severity that would provide researchers with the opportunity to investigate and compare different patterns of disorder. Age of onset, time since diagnosis, frequency of relapse, dependency on medication or treatment, chronicity, personal and social functioning are among variables that could be examined.

Strengths and Limitations

The most important contribution of the study and its contribution to the previous research is the importance of communication between healthy siblings and their parents in families with a child with a chronic condition. Constructive communication regarding the illness between the healthy children and their parents was associated with sibling warmth, family cohesion and adaptability. The role of communication was especially important in the interactions between the older children and their parents. An essential finding that signified the importance of communication was the role of communication when healthy siblings believed that their mothers' treatment towards them was unfair. Even though they believed that their mothers' treatment was unjust, their communication with their parents moderated their judgments of family cohesion; therefore, despite the unjust treatment they received, they reported bonding among family members.

Another important finding and contribution of the present study was the role of severity of chronic illness in family studies. Considering the mere presence or absence of a chronic condition as a predictor of sibling or family relationships could be very misleading; different factors could have different outcomes depending on the severity of the condition. Factors such as siblings' judgment about fairness of their mothers' behaviour and communication between the healthy siblings and their parents had limited effects in predicting sibling or family relationships when the illness was more severe.

This study also underlined the importance of age in family studies. Dynamics between the siblings and between the parents and their children could not be examined fully without special consideration of the developmental level of the children engaged in these interactions.

The nature of Tourette Syndrome comorbid with various disorders made it very hard to find a corresponding comparison group. The limited prevalence of Tourette Syndrome, especially the imbalance between the occurrence of Tourette Syndrome in males versus females, limited our ability to have a balanced distribution of age and sex groups. There is a genetic disposition among the family members of the individuals with Tourette Syndrome, in which the family members are more likely to have Tourette Syndrome or other conditions; therefore, it proved to be very challenging to find siblings who did not have any psychological condition. It would have been more satisfactory if the participants were interviewed; however, due to the nature of the illness and its comorbid disorders, and the strain it inflicts both on the parents and the children, a more non-invasive method was chosen. The sample was not a random sample. Participating families that visited the websites or locations with the study's advertisement were not necessarily representative sample of families with a child with Tourette Syndrome. Therefore, the sample could be biased. The limited number of participants in the study was a

disadvantage; nevertheless, considering the rarity of the disorder, 55 cases would be roughly enough to achieve reliable findings.

Despite these limitations, the present study was the first attempt to investigate both sibling and family relationships from the healthy siblings' perspective in families with siblings who have Tourette Syndrome. The present study was unique in investigating the effect of severity and comorbidity, and its association with sibling and family relationships. Few studies had investigated communication in families with a chronic illness. So far no study has been done on communication among family members in families with Tourette Syndrome. The sample size of the present study was relatively larger than the ones used in past studies on chronic conditions, including Tourette Syndrome.

References

American Psychiatric Association (1994). *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.). Washington, DC: Author.

Bank , S. P., & Kahn, M. D. (1982). *The sibling bond*. New York: Basic Books.

Bauer, A. M., & Shea, T. M. (1984). Tourette Syndrome: A review and educational implications. *Journal of Developmental Disorders*, *14(1)*, 69-80.

Bernstein, G. A., Anderson, L. K., Hektner, J. M., Realmuto, G. M. (2000). Imipramine compliance in adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry, 39(3)*, 284-291

Boll, T., Filipp, S.H., & Ferring, D. (2003). Perceived parental differential treatment in middle adulthood: Curvilinear relations with individuals' experienced relationship quality to sibling and parents. *Journal of Family Psychology*, *17(4)*, 472-487.

Boll, T., Filipp, S.H., & Ferring, D. (2005). Effects of parental differential treatment on relationship quality with siblings and parents: Justice evaluations as mediators. *Social Justice Research, 18(2)*, 155-182.

Breslau, N., Weitzman, M., & Messenger, K. (1981). Psychological functioning of siblings of disabled children. *Pediatrics*, *67*, 344-353.

Brody, L. R., Copeland, A. P, Sutton, L. S., Richardson, D. R., & Guyer, M. (1998). Mommy and Daddy like you best: Perceived family favouritism in relation to affect, adjustment and family process. *Journal of Family Therapy*, *20(3)*, 269-291.

Brody, G. H., & Stoneman, Z. (1995). Sibling relationships in middle childhood. *Annals of Child Development*: A Research Annual, *11*, 73-93.

Brody, G. H., Stoneman, Z., & Burke, M. (1987). Child temperaments, maternal differential behaviour, and sibling relationships. *Developmental Psychology*, *23(3)*, 354-362.

Brody, G. H., Stoneman, Z., & Gauger, K. (1996). Parent-child relationships, family problem-solving behavior, and sibling relationship quality: The moderating role of sibling temperaments. *Child Development*, *67(3)*, 1289-1300.

Brody, G. H., Stoneman, Z., McCoy, J. K., & Forehand, R. (1992). Contemporaneous and longitudinal associations of sibling conflict with family relationship assessments and family discussions about sibling problems. *Child Development*, *63*, 391-400.

Brody, G. H., Stoneman, Z., & McCoy, J. K. (1994). Contributions of family relationships and child temperaments to longitudinal variations in sibling relationship quality and sibling relationship styles. *Journal of Family Psychology*, *8(3)*, 274-286.

Budman, C. L., Bruun, R. D., Park, K. S., & Olson, M. E. (1998). Rage attacks in children and adolescents with Tourette's disorder: A pilot study. *Journal of Clinical Psychiatry*, *59(11)*,576-580.

Budman, C. L., Bruun, R. D., Park, K. S., Lesser, M., & Olson, M. E. (2000). Explosive outbursts in children with Tourette's disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*. *39(10)*, 1270-1276.

Budman, C. L., Rockmore, L., Stokes, J., & Sossin, M. (2003) Clinical phenomenology of episodic rage in children with Tourette syndrome. *Journal of Psychosomatic Research, 55(1)*, 59-65.

Cadman, D., Boyle, M., & Offord, D. (1988). The Ontario Child Health Study: social adjustment and mental health of siblings of children with chronic health problems. *Developmental and Behavioral Pediatrics*, *9*, 117-121.

Carpenter, P.J. & Sahler, O. J. Z. (1991). Sibling perception and adaptation to childhood cancer: Conceptual and methodological considerations. In J. H. Johnson & S. B. Johnson (Eds.). *Advances in Child Health Psychology,* 193-205.

Coffey, B. J., Miguel, E. C., Biederman, J., Baer, L., Rauch, S. L., O' Sullivan, R. L. et al., (1998). Tourette's Disorder with and without Obsessive-Compulsive Disorder in adults: Are they different? *Journal of Nervous and Mental Disease*, *186* (4), 201-206.

Compton, M. T., Thompson, N. J., & Kaslow, N. J. (2005). Social environment factors associated with suicide attempt among low-income African Americans. *Social Psychiatry and Psychiatric Epidemiology, 40(3)*, 175-185.

Cooper, C., & Livingston G. (2003). Psychological morbidity and caregiver burden in parents of children with Tourette's Disorder and psychiatric comorbidity. *Child and Adolescent Psychiatry*, *42 (11)*, 1370-1375.

Conners, C. K. (1997). *Conners' Rating Scales - Revised: Technical Manual.* Toronto: Ontario, Multi-Health Systems Inc.

Crouter, A. C., McHale, S. M., & Jenkins Tucker, C. (1999). Does stress exacerbate parental differential treatment of siblings? A pattern-analytic approach. *Journal of Family Psychology*, *13(2)*, 286-299.

Daniels, D., & Plomin, R. (1984). Differential experience of siblings in the same family. *Developmental Psychology*, *21(5)*, 747-760.

Dundas, I. (1994). The Family Adaptability and Cohesion Scale III in a Norwegian sample. *Family Process*, *33 (2)*, 191-202.

Dunn, J., & Plomin, R. (1990). *Separate lives: Why siblings are so different*. New York: NY, Basic Books Inc.

Edell-Fisher, B. H., & Motta, R. W. (1990). Tourette Syndrome: Relation to children's and parents' self-concepts. *Psychological Reports*, *66*, 539-545.

Eustace, C. O. (1984). *Siblings of children with Tourette's Syndrome: Personal adjustment and family adaptation*. Unpublished doctoral dissertation, Pace University, New York.

Faux, S. A. (1991). Sibling relationships in families with congenitally impaired childern. *Journal of Pediatric Nursing*, *6(3)*, 175-184).

Freeman, R. D., Fast, D. K., Burd, L., Kerbeshian, J., Robertson, M. M., & Sandor, P. (2000). An international perspective on Tourette Syndrome: Selected findings from 3500 individuals in 22 countries. *Developmental Medicine & Child Neurology*, *42*, 436-447.

Fox, T. L., Barrett, P. M., & Shortt, A. L. (2002). Sibling relationships of anxious children: A preliminary investigation. *Journal of Clinical Child and Adolescent Psychology, 31(3)*, 375-383.

Furman, W. & Buhrmester, D. (1985). Perceptions of sibling relationships during middle childhood and adolescence. *Child Development, 61(5)*, 1387-1398.

Goodman, W.K., Price, L. H., Rasmussen, S. A., Mazure, C., Delgado, P., Heninger, G. R., et al. (1989a). The Yale-Brown Obsessive Compulsive Scale: II.Validity. *Archives of General Psychiatry, 46*, 1012-1016.

Goodman, W.K., Price, L. H., Rasmussen, S. A., Mazure, C., Fleischmann, R. L., Hill, C. L., et al. (1989b). The Yale-Brown Obsessive Compulsive Scale: I. Development, use and reliability. *Archives of General Psychiatry*, *46*, 1006-1011.

Goodman, W.K., Rasmussen, S. A., Price, L. H., Mazure, C., Heninger, G. R., & Charney, D. S. (1989c). Yale-Brown Obsessive Compulsive Scale (Y-BOCS). Department of Psychiatry

Yale University School of Medicine and Department of Psychiatry Brown University School of Medicine.

Greeff, A. P. (2000). Characteristics of Families that Function Well. *Journal of Family Issues*, *21 (8)*, 948-962.

Griffin, J. E. & D'Andrea, L. M.(1997). Using FACES-II to classify the relationship status of battered women. *Family Journal: Counseling and Therapy for Couples and Families*, *5(4)*, 303-308.

Guite, J., Lobato, D., Kao, B., & Plante, W. (2004). Discordance between sibling and parent reports of the impact of chronic illness and disability on siblings. *Children's Health Care*, *33(1)*, 77-92.

Havermans, T., & Eiser, C. (1994). Siblings of a child with cancer. *Child Care, Health, and Development*, *20*, 309-322.

Henderson, S. H., Hetherington, E. M., Mekos, D., & Reiss, D. (1996). Stress, parenting, and adolescent psychopathology in non-divorced and stepfamilies: A within family perspective. In E. M. Hetherington & E. A. Blechman (Eds.), *Stress, coping, and resiliency in children and families*. Mahwah, NJ: Lawrence Erlbaum Associates.

Hechtman, L. (1996). Families of children with Attention Deficit Hyperactivity Disorder. *Canadian Journal of Psychiatry*, *41(6)*, 350-360.

Hetherington, E. M., Reiss, D., & Plomin, R. (1994). *Separate social worlds of siblings: The impact of nonshared environment on development*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Holtz, K. D. (2000). The psychosocial implications of Tourette Syndrome in children: Evaluation of an intervention. (Doctoral dissertation, George Washington University, 2000). *Dissertation Abstracts International*, *61*, 2242.

Hornsey, H., & Banejee, S. (2001). The prevalence of Tourette Syndrome in 13–14-year-olds in mainstream schools. *Journal of Child Psychology and Psychiatry*, *42(8)*, 1035-1039.

Hubka, G. B., Fulton, W. A., Shady, G. A., Champion, L. M., & Wand, R. (1988). Tourette Syndrome: Impact on Canadian family functioning. *Neuroscience and Behavioral Reviews*, *12*, 259-261.

Kadesjö, B., & Gillberg, C. (2000). Tourette's disorder: Epidemiology and comorbidity in primary school children. *Journal of the American Academy of Child & Adolescent Psychiatry*. *39(5)*, 548-555.

Kendall, J. (1999). Sibling accounts of Attention Deficit Hyperactivity Disorder (ADHD). *Family Process*, *38*, 117-136.

Kearns, D. L. R. (1990). Tourette Syndrome patients and their parents: Perceptions of family behavior and beliefs about health. (Doctoral dissertation, Georgia State University, 1990). *Dissertation Abstracts International, 51*, 3569.

Kowal, A., & Kramer, L. (1997).Children's understanding of parental differential treatment. *Child Development*, *68(1)*,113-126.

Kowal, A., & Kramer, L. (in press). Shared understanding of parental differential treatment in families. *Social Development*.

Kowal, A. K., Krull, J. L., & Kramer, L. (2004). How the differential treatment of siblings is linked with parent-child relationship quality. *Journal of Family Psychology*, *18(4)*, 658-665.

Kumar, G., & Steer, R. A. (2003). Factorial validity of the Conners' Parent Ratting Scale-Revised: Short Form with psychiatric outpatients. *Journal of Personality Assessment*, *80(3)*, 252-259.

Kurlan, R., Como, P. G., Miller, B., Palumbo, D., Deeley, C. & Andresen, E. M. et al. (2002). The behavioral spectrum of tic disorders: A community-based study. *Neurology*. *59(3)*, 414-420.

Kurlan, R., McDermott, M. P., Deeley, C., Como, P.G., Brower, C., Eapen, S., et al. (2001). Prevalence of tics in schoolchildren and association with placement in special education. *Neurology*. *57(8)*, 1383-1388.

Kushner, H.L.(1999). *A cursing brain: The histories of Tourette Syndrome*. MA: Cambridge, Harvard Unioversity Press.

Labay, L. E., & Walco, G. A. (2004). Brief Report: Empathy and psychological adjustment in siblings of children with cancer. *Journal of Pediatric Psychology, 29(4)*, 309-314.

Lavigne, J. V., & Ryan, M. (1979). Psychological adjustment of siblings of children with chronic illness. *Pediatrics*, *63 (4)*, 616-627.

Leckman, J.F., Riddle, M.,A., Hardin, M. T., Ort, S. I., Swartz, K. L., Stevenson, J., et al. (1989). The Yale Global Tic Severity Scale: Initial testing of a clinician–rated scale of tic severity. *Journal of American Academy of Child and Adolescent Psychiatry, 28(4)*, 566-573.

Lobato, D., Faust, D., & Spirito, A. (1988). Examining the effects of chronic disease and disability and children's sibling relationships. *Journal of Pediatric Psychology*, *13(3)*, 389-407.

Lobato, D.J., & Kao, B.T. (2002). Integrated sibling-parent group intervention to improve sibling knowledge and adjustment to chronic illness and disability. *Journal of Pediatric Psychology*, *27(8)*, 711-716.

Lobato, D. J. & Kao, B. T. (2005) Brief report: Family based intervention for young siblings of children with chronic illness and developmental disability. *Journal of Paediatric Psychology*, *30(8)*, 678-982.

Loman, P.A. (2000). Relationship quality between healthy and chronically ill siblings: The differential impact of Tourette's Syndrome and Diabetes. (Doctoral dissertation, Yale University, 2000). *Dissertation Abstracts International*, *61*, 5597.

McGuire, S., Dunn, J., & Plomin, R. (1995). Maternal differential treatment of siblings and children's behavioral problems: A longitudinal study. *Development and Psychopathology*, *7*, 515-528.

McGuire, S., Manke, B., Eftekhari, A., & Dunn, J. (2000). Children's perceptions of sibling conflict during middle childhood: Issues and sibling (dis)similarity. *Social Development, 9(2)*, 173-190.

McHale, S. M., & Gamble, W. C. (1989). Sibling relationships of children with disabled and non-disabled brothers and sisters. *Developmental Psychology*, *25(3)*, 421-429.

McHale, S. M., & Pawletko, T. M. (1992). Differential treatment of siblings in two family contexts. *Child Development*, *63(1)*, 68-81.

McHale, S. M., Crouter, A. C., McGuire, S., & Updegraff, K. A.(1995). Congruence between mothers' and fathers' differential treatment of siblings: Links with family relations ands children's wellbeing. *Child Development*, *66*, 116-128.

McKeever, P. (1983). Siblings of chronically ill children: A literature review with implications for research and practice. *American Journal of Orthopsychiatry*, *53(2)*, 209- 218.

Meyer, D. (1993). Siblings of children with special health and developmental needs. Retrieved from http://endoflifecare.tripod.com/Caregiving/id116.html.

Moser, R. P., & Jacob, T. (2002). Parental and sibling effects in adolescent outcomes. *Psychological Reports*, *91*, 463-479.

Olson, D. H. (1999). Circumplex Model of Marital and Family Systems. *Journal of Family Therapy*. *Special Issue: Empirical approaches to family assessment, 22(2)*, 144-167.

Olson, D. H., Portner, J., & Bell, R. (1992). *FACES II: Family Adaptability and Cohesion Evaluation Scales*. Family Social Science, University of Minnesota, St. Paul, Minnesota.

Pit-ten Cate, I. M., & Loots, G. M. P.I. (2000). Experiences of siblings of children with physical disabilities: An empirical investigation. *Disability and Rehabilitation*, *22(9)*, 399-408.

Robertson, M. M., Banerjee, S., Kurlan, R., Cohen, D. J., Leckman, J. F., McMahon, W., et al. (1999). The Tourette Syndrome Diagnostic Confidence Index: Development and clinical associations. *Neurology*, *53*, 2108-2112.

Robertson, H. A., Kutcher, S. P., Bird, D., & Grasswick, L. (2001). Impact of early onset bipolar disorder on family functioning: Adolescents' perceptions of family dynamics, communication, and problems. *Journal of Affective Disorders*, *66(1)*, 25-37.

Ross, H. S., Filyer, R. E., Lollis, S. P., Perlman, M., & Martin, J. L. (1994). Administering Justice in the family. *Journal of Family Psychology*, *8(3)*, 254-273.

Ross, H., Martin, J., Perlman, M., Smith, M., Blackmore, E., & Hunter, J. (1996). Autonomy and authority in the resolution of sibling disputes. In M. Killen (Ed.), Children's autonomy,

social competence, and interactions with adults and other children: Exploring connections and consequences. *New Directions for Child Development*, *73*, 71- 90.

Sahler, O.J. Z, Roghmann, K. J., Carpenter, P. J., Mulhern, R. K., Dolgin, M. J., Sargent, J. R., et al. (1994). Sibling adaptation to childhood cancer collaborative study: Prevalence of sibling distress and definition of adaptation levels. *Developmental and Behavioral Pediatrics*, *15(5)*, 353-366.

Sharpe, D., & Rossiter, L. (2002). Siblings of children with a chronic illness: A meta-analysis. *Journal of Pediatric Psychology*, *27(8)*, 699-710.

Silver, J.M., & Yudofsky, S.C. (1991). The Overt Aggression Scale: Overview and guiding principles. *Journal of Neuropsychiatry and Clinical Neurosciences*, *3(2)*, S22-S29.

Simeonsson, R. J., & McHale, S. M. (1981). Review: Research on handicapped children: Sibling relationships. *Child: Care, Health and Development*, *7*, 153-171.

Slomkowski, C., Cohen, P., & Brook, J. (1997). The sibling relationships of adolescents with antisocial and comorbid mental disorders: An epidemiological investigation. *Criminal Behaviour and Mental Health. Special Issue: Criminality, substance abuse and psychiatric disorders: Comorbidity and multiple risk factors, 7(4)*, 353-368.

Spencer, T., Biederman, J., Harding, M., O'Donnell, D., Wilens, T., Faraone, S. et al. (1998). Disentangling the overlap between Tourette's disorder and ADHD. *Journal of Child Psychology and Psychiatry*, *39(7)*, 1037-1044.

Stallard, P., Mastroyannopoulou, K., Lewis, M., & Lenton, S. (1997). The siblings of children with life-threatening conditions. *Child Psychology and Psychiatry Review*, *2(1)*, 26-33.

Statistical Product and Service Solutions (SPSS) 14 (2005). [Computer Software]. Chicago, IL: SPSS Inc.

Stephens, R. J., & Sandor, P. (1999). Aggressive behaviour in children with Tourette syndrome and comorbid Attention Deficit Hyperactivity Disorder and Obsessive-Compulsive Disorder. *Canadian Journal of Psychiatry*. *44(10)*, 1036-1042.

Stocker, C. Dunn, J., & Plomin, R. (1989). Sibling relationships: Links with child temperament, maternal behaviour, and family structure. *Child Development*, *60*, 715-727.

Stoneman, Z., & Brody, G.H. (1993). Sibling temperaments, conflict, conflict, and role asymmetry. *Child Development*, *64(6)*, 1786-1800.

Storch, E. A., Murphy, T. K., Geffken, G. R., Sajid, M., Allen, P., Roberti, J. W., et al. (2005). Reliability and validity of the Yale Global Tic Severity Scale. *Psychological Assessment, 17(4)*, 486-491.

Sukhodolsky, D. G., Scahill, L., Zhang, H., Peterson, B. S., King, R. A., Lombroso, P.J., et al. (2003). Disruptive behavior in children with Tourette's syndrome: Association with ADHD comorbidity, tic severity, and functional impairment. *Journal of the American Academy of Child and Adolescent Psychiatry*, *42(1)*, 98-105.

Taylor, V., Fuggle, P., & Charman, T. (2001). Well sibling psychological adjustment to chronic physical disorder in a sibling: How important is maternal awareness of their illness attitudes and perceptions. *Journal of Child Psychology and Psychiatry & Allied Disciplines*, *42(7)*, 953-962.

Thibert, A. L., Day, H. I., & Sandor, P. (1995). Self-concept and self-consciousness in adults with Tourette Syndrome. *Canadian Journal of Psychiatry*, *40*, 35-39.

Vandell, D. L., & Bailey, M. D. (1992). *Conflict between siblings*. In Shantz, C. U. & Hartup, W. W. (Eds.), Conflict in child and adolescent development. New York, NY: Cambridge University Press.

Weiss, K. A., Schiaffino, L. M., & Ilowite, N. (2001). Predictors of sibling relationship characteristics in youth with juvenile chronic arthritis. *Children's Health Care, 30(1)*, 67-77.

Wilkinson, B. J., Newman, M. B., Shytle, R. D., Silver, A. A., Sanberg, P. R., & Sheehan, D. (2002). Family impact of Tourette's Syndrome. *Journal of Child and Family Studies*, *10(4)*, 477-483.

Williams, P. D. (1997). Siblings and pediatric chronic illness: a review of the literature. *International Journal of Nursing Studies*, *34(4)*, 312-323.

Williams, P.D., Williams, A.R., Graff, J.C., Hanson, S., Stanton, A., Hafeman, C., et al. (2002). Interrelationships among variables affecting well siblings and mothers in families of children with a chronic illness or disability. *Journal of Behavioural Medicine*, *25(5)*, 411-424.

Appendix A

Descriptive Statistics for Imputed Missing Variables Using EM Method

MVA

Univariate Statistics

	N	Mean	Std. Deviation	Missing		No. of Extremes[a]	
				Count	Percent	Low	High
HWarmth	50	3.0360	.87228	5	9.1	0	0
HConflict	50	3.3872	.93608	5	9.1	1	0
HCohesion	50	15.0000	6.87794	5	9.1	1	2
HAdaptability	50	30.4400	7.98509	5	9.1	1	2
HMChore	50	3.5334	.70320	5	9.1	1	0
HMChoreFair	50	2.7466	1.06162	5	9.1	0	0
HMAffection	50	3.0840	.39194	5	9.1	4	2
HMAffectFair	50	2.3200	.87131	5	9.1	0	0
HMControl	50	3.2900	.63559	5	9.1	1	1
HMControlFair	49	2.9643	.92702	6	10.9	0	0
HMTime	49	3.1837	.92811	6	10.9	3	0
HMTimeFair	48	2.4167	.98571	7	12.7	0	0

a. Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).

Summary of Estimated Means

	HWarmth	HConflict	HCohesion	HAdaptability	HMChore	HMChoreFair	HMAffection	HMAffectFair	HMControl	HMControlFair	HMTime	HMTimeFair
	3.0360	3.3872	15.0000	30.4400	3.5334	2.7466	3.0840	2.3200	3.2900	2.9643	3.1837	2.4167
	3.0264	3.3999	15.0389	30.5070	3.5312	2.7436	3.0829	2.3128	3.2902	2.9347	3.1859	2.3925

Summary of Estimated Standard Deviations

	HWarmth	HConflict	HCohesion	HAdaptability	HMChore	HMChoreFair	HMAffection	HMAffectFair	HMControl	HMControlFair	HMTime	HMTimeFair
All Values	.87228	.93608	6.87794	7.98509	.70320	1.06162	.39194	.87131	.63559	.92702	.92811	.98571
EM	.86175	.93122	6.91084	8.11553	.70155	1.05819	.39163	.87145	.63330	.94000	.92290	.99286

EM Estimated Statistics

EM Means[a]

HWarmth	HConflict	HCohesion	HAdaptability	HMChore	HMChoreFair	HMAffection	HMAffectFair	HMControl	HMControlFair	HMTime	HMTimeFair
3.0264	3.3999	15.0389	30.5070	3.5312	2.7436	3.0829	2.3128	3.2902	2.9347	3.1859	2.3925

a. Little's MCAR test: Chi-Square = 57.196, DF = 44, Sig. = .088

EM Covariances[a]

	HWarmth	HConflict	HCohesion	HAdaptability	HMChore	HMChoreFair	HMAffection	HMAffectFair	HMControl	HMControlFair	HMTime	HMTimeFair
HWarmth	.74261											
HConflict	-.25760	.86718										
HCohesion	2.8613	.21226	47.7598									
HAdaptability	3.9867	-1.4330	44.5091	65.8618								
HMChore	-.04204	.14375	-.84390	-1.74393	.49218							
HMChoreFair	-.23245	.34750	-1.51288	-2.26925	.39881	1.1198						
HMAffection	-.01385	.02172	-.54191	-.85108	.01477	.04758	.1534					
HMAffectFair	-.10052	.01567	-.53675	-1.11614	-.0430	.36749	.0706	.7594				
HMControl	-.04304	.15940	-.93845	-1.56682	.15752	.29174	.0651	.1958	.4011			
HMControlFair	-.20297	.26873	-1.43919	-1.79433	.09369	.47714	.1035	.4747	.4221	.8836		
HMTime	.00494	-.07596	-1.12417	-.62668	.00104	.14952	.2247	.2623	.1559	.3133	.8517	
HMTimeFair	-.04049	.07354	.21019	.57969	-.1883	.14813	.0781	.4789	.1511	.3699	.1525	.9858

a. Little's MCAR test: Chi-Square = 57.196, DF = 44, Sig. = .088

EM Correlations[a]

	HWarmth	HConflict	HCohesion	HAdaptability	HMChore	HMChoreFair	HMAffection	HMAffectFair	HMControl	HMControlFair	HMTime	HMTimeFair
HWarmth	1											
HConflict	-.321	1										
HCohesion	.480	.033	1									
HAdaptability	.570	-.190	.794	1								
HMChore	-.070	.220	-.174	-.306	1							
HMChoreFair	-.255	.353	-.207	-.264	.537	1						
HMAffection	-.041	.060	-.200	-.268	.054	.115	1					
HMAffectFair	-.134	.019	-.089	-.158	-.070	.399	.207	1				
HMControl	-.079	.270	-.214	-.305	.355	.435	.263	.355	1			
HMControlFair	-.251	.307	-.222	-.235	.142	.480	.281	.580	.709	1		
HMTime	.006	-.088	-.176	-.084	.002	.153	.622	.326	.267	.361	1	
HMTimeFair	-.047	.080	.031	.072	-.270	.141	.201	.554	.240	.396	.166	1

a. Little's MCAR test: Chi-Square = 57.196, DF = 44, Sig. = .088

Appendix B

Healthy Siblings' Reports of Understanding of the Questionnaires and Amount of Help Received from their Parents

Table 23

Mean and Standard Deviation for Healthy Siblings' Understanding of the Questionnaires and Amount of Help Received from the Parents

Measures	Understanding			Help Received		
	N	Mean[a]	SD	N	Mean[b]	SD
Communication	52	2.019	0.999	52	3.576	1.210
SIDE	47	2.212	0.907	48	3.458	1.184
FACES-II	50	1.92	1.006	50	3.64	1.273
SRQ	49	1.775	0.918	50	4.08	1.026

a. Five-point Likert scale 1= very well , 5 = not at all
b. Five-point Likert scale 1 = all the time, 5 = never

Appendix C

Descriptive Statistics of Healthy Siblings' Evaluation of Equality and Fairness of Maternal Differential Treatment

Table 24

Frequency and Percentage of Healthy Siblings' Evaluation of Equality and Fairness of Maternal Differential Treatment in Chores

	Item	Fair	NeitherFair Nor Unfair	Unfair	N
Equal	1	12(24%)	6(12%)	2(4%)	50
	2	21(42%)	16(32%)	0(0%)	50
	3	12(24%)	10(20%)	1(2%)	50
Inequal	1	8(16%)	3(6%)	19(38%)	50
	2	5(10%)	4(8%)	8(16%)	50
	3	9(18%)	4(8%)	14(28%)	50

Table 25

Frequency and Percentage of Healthy Siblings' Evaluation of Equality and Fairness of Maternal Differential Treatment in Affection

	Item	Fair	NeitherFair Nor Unfair	Unfair	N
Equal Treatment	1	20(40.82%)	17(34.70%)	2(4.08%)	49
	2	19(38.78%)	20(40.82%)	1(2.04%)	49
	3	16(33.30%)	19(39.58%)	0(0%)	48
	4	19(38.78%)	20(40.82%)	0(0%)	49
	5	16(34.04%)	15(31.91)	1(2.13%)	47
Inequal Treatment	1	6(12.24%)	0(0%)	4(8.16%)	49
	2	2(4.08%)	3(6.12%)	4(8.16%)	49
	3	6(12.50%)	2(4.20%)	5(10.42%)	48
	4	5(10.20%)	3(6.12%)	2(4.08%)	49
	5	2(4.26%)	3(6.38)	10(21.28%)	47

Table 26

Frequency and Percentage of Healthy Siblings' Evaluation of Equality and Fairness of Maternal Differential Treatment in Control

	Item	Fair	NeitherFair Nor Unfair	Unfair	N
Equal Treatment	1	15(30%)	13(26%)	1(2%)	50
	2	10(20%)	13(26%)	2(4%)	50
	3	11(22.45%)	23(46.94)	2(4.08%)	49
	4	14(29.17%)	19(39.58)	0(0%)	48
Inequal Treatment	1	3(6%)	5(10%)	13(26%)	50
	2	6(12%)	2(4%)	17(34%)	50
	3	0(0%)	3(6.12%)	10(20.41%)	49
	4	2(4.17%)	1(2.08%)	12(25%)	48

Table 27

Frequency and Percentage of Healthy Siblings' Evaluation of Equality and Fairness of Maternal Differential Treatment in Time

	Item	Fair	NeitherFair Nor Unfair	Unfair	N
Equal Treatment	1	12(25%)	17(35.41%)	0(0%)	48
Inequal Treatment	1	9(18.75%)	5(10.42%)	5(10.42%)	48

Appendix D

Healthy Siblings' Attributions Regarding Fairness/Unfairness of Maternal Differential Treatment

Table 28

Healthy Siblings' Attributions Explaining Fairness Evaluation of Maternal Differential Treatment in Chores[a] *(N=148)*

Attributions	Frequency	Percentage
Age	16	10.8
Special Circumstances	7	4.7
Equal Treatment	12	8.1
Family Alliances	1	0.70
Gender	1	0.70
Inequal Treatment	10	6.80
Personal Attributes	2	1.4
Parental Expectations	5	3.40
Parent's Reasoning Faulty	9	6.10
Sense of Responsibility	21	14.20
Sibling Driven Behavior	8	5.40
Self Driven Behavior	9	6.1
Sibling's Needs	2	1.4
Not Specified	40	27

a. Kappa: Item 1, .710, $p<.01$. Item 2, .703, $p<.01$. Item 3, .751, $p<.01$.

Table 29

Healthy Siblings' Attributions Explaining Fairness Evaluation of Maternal Differential Treatment in Affection[a] *(N=260)*

Reason	Frequency	Percentage
Age	1	.40
Special Circumstances	1	.40
Equal Treatment	91	35
Family Alliances	15	5.8
Gender	3	1.2
Inequal Treatment	3	1.2
Parent's Reasoning Faulty	2	.80
Sibling Driven Behavior	1	.40
Self Driven Behavior	5	1.9
Sibling's Needs	8	3.1
Own Needs	1	.40
Not Specified	16	6.2

a. Kappa: Item 1, .881, $p<.01$. Item 2, .875, $p<.01$. Item 3, .791, $p<.01$. Item 4, .919, $p<.01$. Item 5, .963.

Table 30

Healthy Siblings' Attributions Explaining Fairness Evaluation of Maternal Differential Treatment in Control[a] (N=257)

Attributions	Frequency	Percentage
Age	5	1.9
Special Circumstances	2	0.80
Equal Treatment	31	12.1
Inequal Treatment	4	1.6
Parental Expectations	3	1.2
Parent's Reasoning Faulty	23	8.9
Sibling Driven Behavior	6	2.3
Self Driven Behavior	3	1.2
Sibling's Needs	3	1.2
Not Specified	165	64.2

a. Kappa: Item 1, .748, $p<.01$. Item 2, .842, $p<.01$. Item 3, .432, $p<.01$. Item 4, .860.

Table 31

Healthy Siblings' Attributions Explaining Fairness Evaluation of Maternal Differential Treatment in Time[a] *(N=55)*

Attributions	Frequency	Percentage
Special Circumstances	4	7.3
Equal Treatment	11	20
Family Alliances	3	5.5
Inequal Treatment	2	3.6
Sibling Driven Behavior	2	3.6
Sibling's Needs	3	5.5
Not Specified	2	3.6

a. Kappa: Item 1, .771, $p<.01$.

Appendix E

Results of Reliability Analyses

Table 32

Results of Reliability Analyses for Scales Used in the Study

Scale	Varibales	Cronbach's Alpha
Yale Global Tic Severity Scale-Family Rated*	Phonic tics-Motor tics-Frequency-Intensity-Interference	.848
Yale-Brown Obsessive Compulsive Scale*	Obsession- Compulsion	.957
Conners' Parent Rating Scale-Revised-Short form*	Attention Deficit Hypearctivity Disorder	.948
Overt Aggression Scale*	Verbal aggression-Physical aggression against objects- Physical aggression against self- Physical aggression against others	.815
Sibling Inventory of Differential Experience	Chores-Affection-Control-Time	.860
Family Adaptability and Cohesion Evaluation Scale-II	Cohesion	.618
	Adaptability	.785
Sibling Relationship Questionnaire	Warmth	.918
	Closeness	.882
Communication Questionnaire	Knowledge-Constructive Discussions	.763

* The Cronbach's alpha for the combined index of Yale Global Tic Severity Scale, Yale-Brown Obsessive-Compulsive Scale, Conners' Parent Rating Scale, and Overt Aggression Scale was 0.901.

Appendix F

Healthy Siblings' Perceptions versus Mothers' and Fathers' Perceptions

Paired sample t-tests were used to examine the agreement between healthy siblings' and mothers' reports of warmth and conflict in the sibling relationship, cohesion and adaptability in the family relationship, maternal differential treatment, fairness evaluation of maternal differential treatment and constructive communication between the healthy siblings and the parents. The result of the analyses revealed that the healthy siblings' and mothers' reports regarding warmth, conflict, both maternal differential treatment and fairness evaluation in affection, control, time, and constructive discussions were similar, and the t-tests were not significant (see Table 33). However, there was significant difference between healthy siblings' and mothers' reports of family cohesion and adaptability, both maternal differential treatment and fairness evaluation of maternal differential treatment in chores, and fairness evaluation of maternal differential treatment in control (see Table 33).

Table 33

Results of Paired Sample T-Tests between Healthy Siblings' and Mothers' Reports of Sibling and Family Relationships

Variable	Healthy Sibling Mean	Mother Mean	t	df	r
Sibling Warmth	2.95	3.06	-0.729	24	.670**
Sibling Conflict	3.45	3.21	1.56	23	.626**
Family Cohesion	13.40	16.12	-2.51*	24	.737**
Family Adaptability	28.71	31.17	-2.51*	23	.847**
Maternal Differential Treatment	0.005	-0.111	0.220	24	.459*
Fairness Evaluation	0.193	-0.177	0.527	23	.302
Maternal Differential Treatment in Chores	4.47	3.16	2.95**	26	-.074
Maternal Differential Treatment in Affection	3.18	3.10	1.06	24	.389†
Maternal Differential Treatment in Control	3.36	3.14	1.84	24	.499*
Maternal Differential Treatment in Time	3.28	3.00	1.43	24	.178
Fairness Evaluation in Chores	3.51	2.14	4.12**	26	.305
Fairness Evaluation in Affection	2.43	2.34	0.49	24	.102
Fairness Evaluation in Control	3.06	2.53	2.17*	24	-.036
Fairness Evaluation in Time	2.29	2.38	-0.29	23	.057
Constructive Discussions	3.91	3.86	0.16	21	.176
Confrontational Discussions	4	4.09	-0.40	21	.404
Effect on Sibling Relationship	3.32	3.59	-1.67	21	.593**

** $p < .01$. * $p < .05$. † $p = .055$.

There were a number (N=15) of healthy siblings who had not completed the Sibling Inventory of Differential Experience (SIDE) for their fathers, since their fathers were not living with them. There were not enough of these participants to carry out regression analysis with the small sample size. Therefore, to ensure sufficient power, minimize the probability of errors, maximize the accuracy of population estimates, and increase the generalizability of the results, the results of paternal differential treatment scale were not used in the regression analysis. However, paired sample t-tests were carried out to compare the perception of differential treatment and fairness evaluation of differential treatment for those participants that had answered the questions for both the mothers and the fathers. The results of the analyses for 40 of the healthy siblings who had completed Sibling Inventory of Differential Experience (SIDE) for both their mothers and fathers revealed that there was no significant difference between healthy siblings' reports of maternal and paternal differential treatment in areas of chores, affection, control and time (see Table 34). There was no significant difference between healthy siblings' reports of fairness evaluation of maternal and paternal differential treatment in areas of chores, control and time, except for the fairness evaluation of maternal differential affection versus fairness evaluation of paternal differential affection (see Table 34). Healthy siblings reported that the differential affection of fathers was more unfair that that the differential affection of the mothers.

Table 34

Results of Paired Sample T-Tests between Healthy Siblings' Reports of Maternal and Paternal Differential Treatment

	Mother	Father		
Variable	Mean	Mean	t	df
Maternal Differential Treatment in Chores	3.45	3.23	1.85	38
Maternal Differential Treatment in Affection	3.12	3.06	0.901	39
Maternal Differential Treatment in Control	3.32	3.15	1.72	38
Maternal Differential Treatment in Time	3.31	3.15	0.924	38
Fairness Evaluation in Chores	2.68	2.76	-0.566	38
Fairness Evaluation in Affection	2.34	2.64	-2.99**	39
Fairness Evaluation in Control	3.07	2.93	1.02	37
Fairness Evaluation in Time	2.51	2.69	-1.05	38

** $p < .01$.

To explore the consistency between healthy siblings' reports of maternal and paternal differential treatment, and fairness evaluation of maternal and paternal differential treatment, the correlation between the two was carried out. The results revealed that healthy siblings' reports of maternal and paternal differential treatment and fairness evaluation of maternal and paternal

differential treatment in areas of chores, affection, control and time were significantly correlated, except for maternal and paternal differential time (see Table 35).

Table 35

Correlation between Healthy Siblings' Reports Regarding Mothers and Fathers Differential Treatment and Fairness Evaluation

Pair	Differential Treatment		Fairness Evaluation	
Mother versus Father	N	Correlation	N	Correlation
Differential Treatment in Chores	39	.35*	39	.38*
Differential Treatment in Affection	40	.41**	40	.64**
Differential Treatment in Control	39	.42**	38	.41*
Differential Treatment in Time	39	.05	39	.40*

* $p < .01$. * $p < .05$.

Appendix G

Yale Global Tic Severity Scale-Family Rated (YGTSS)

Tic Severity
Modified from Leckman, J.F., Riddle, M.A., Hardin, M.T., Ort, S.I., Swartz, K.L., Stevenson, J., & Cohen D.J. (1989)

Please read this introduction first:
In this questionnaire you will be completing answers about your child with Tourette. Many of the questions concern tics, obsessive-compulsive symptoms, and difficulties with attention and impulsivity. If you are not sure about how to answer something, or are not 100% sure of an answer, we recommend that you give it your "best try". Do not worry about whether there are "right" or "wrong" answers. This is not a test.
It is best for you to complete this form along with your child with Tourette. There might be questions that only the person with Tourette could answer (for example, questions about recurrent thoughts and feelings).
If an answer is "never" or "no", please mark it as such, don't leave it blank. If you leave it blank we won't know if you meant "never/no", or if you happened to skip the question.
As you go through this, you will notice that the sections are clearly titled, and that there are directions at the beginning of each. Please take the time to refresh your memory at the beginning of each section. We have included some definitions to help you in your answers.
Work at a pace that is comfortable for you. We appreciate the hard work that is involved in filling this out.

Has your child ever been officially diagnosed by a physician as having Tourette Syndrome?
Yes No

If yes, by whom was your child diagnosed?
Family Physician
Pediatrician
Psychiatrist
Psychologist
Neurologist
Other

and at what age?

NOTE: This section asks questions about tic symptoms. Complete this for your child even if you think he or she has never had any of these symptoms.

Was tic onset sudden or gradual? Sudden Gradual

Motor Tics
In the last year

The child has experienced, or others have noticed, involuntary and apparently purposeless bouts of eye movements: Yes No

1. Eye blinking, squinting, a quick turning of the eyes, rolling of the eyes to one side, or opening eyes wide very briefly. Yes No

2. Eye gestures such as looking surprised or quizzical, or looking to one side for a brief period of time, as if she/he heard a noise.

- nose, mouth, tongue movements, or facial grimacing. Yes No

3. Nose twitching, biting the tongue, chewing on the lip or licking the lip, lip pouting, teeth baring, or teeth grinding. Yes No

4. Broadening the nostrils as if smelling something, smiling, or other gestures involving the mouth, holding funny expressions, or sticking out the tongue.

- head jerks/movements Yes No

5. Touching the shoulder with the chin or lifting the chin up Yes No

6. Throwing the head back, as if to get hair out of the eyes

- shoulder jerks/movements Yes No

7. Jerking a shoulder Yes No

8. Shrugging the shoulder as if to say "I don't know." Yes No

- arm or hand movements

9. Quickly flexing the arms or extending them, nail biting, poking with fingers, or popping knuckles. Yes No

10. Passing hand through the hair in a combing like fashion, or touching objects or others, punching, or counting with fingers for no purpose, or writing tics, such as writing over and over the same letter or word, or pulling back on the pencil while writing.

- leg, foot or toe movements Yes No

11. Kicking, skipping, knee-bending, flexing or extension of the ankles; shaking, stopping or tapping the foot. Yes No

12. Taking a step forward and two steps backward, squatting, or deep knee-bending.

- abdominal/trunk/pelvis movements. Yes No

13. Tensing the abdomen, tensing the buttocks.

- other simple motor tics. Yes No

14. Any other simple motor tic not mentioned above

- other complex motor tics. Yes No

15. Touching Yes No

16. Tapping Yes No

17. Picking Yes No

18. Evening-up Yes No

19. Reckless behaviours Yes No

20. Stimulus-dependent tics (a tic which follows, for example, hearing a particular word or phrase, seeing a specific object, smelling a particular odour). Yes No

21. Rude/obscene gestures; obscene finger/hand gestures. Yes No

22. Unusual postures. Yes No

23. Bending or gyrating, such as bending over. Yes No

24. Rotating or spinning on one foot. Yes No

25. Copying the action of another (echopraxia) Yes No

26. Sudden tic-like impulsive behaviours. Yes No

27. Tic-like behaviours that could injure/mutilate others. Yes No
28. Self-injurious tic-like behaviour(s).
- other involuntary and apparently purposeless motor tics. (that do not fit in any previous categories) Yes No
29. Other motor tics Yes No

Phonic (Vocal) Tics

Was tic onset sudden or gradual? Sudden Gradual

In the last year, the child has experienced, or others have noticed, involuntary and apparently purposeless bouts of:

1. Coughing. Yes No
2. Throat clearing. Yes No
3. Sniffing. Yes No
4. Whistling. Yes No
5. Animal or bird noises. Yes No
6. Other simple phonic tics. Yes No
7. Syllables. Yes No
8. Words. Yes No
9. Rude or obscene words or phrases. Yes No
10. Repeating what someone else said, either sounds, single words or sentences. Perhaps repeating what's said on TV (echolalia). Yes No
11. Repeating something the child said over and over again (palilalia). Yes No
12. Other phonic tic-like speech problems, such as sudden changes in volume or pitch. Yes No

Severity of Tic Symptoms

Using the following descriptions, please rate the motor and phonic tic symptoms for the last year. Within the last year:

1. How often does your child have tics?

0 = Never has tics. No evidence of tics.

1 = Almost never has tics. Tics occur infrequently, often on a daily basis. Tic-free periods last for several days at a time.

2 = Occasionally has tics. Tics are present on a daily basis. Bouts of tics may occur on occasion, and are not sustained for more than a few minutes at a time. Tic-free intervals last for most of the day.

3 = Frequently has tics. Tics are usually present on a daily basis. Tic-free intervals as long as 3 hours are not uncommon.

4 = Almost always has tics. Tics are present virtually every waking hour of every day, and periods of sustained tic behaviours occur regularly. Tic-free intervals are not frequent, and may last for half an hour at a time.

5 = Always has tics. Tics are present virtually all the time. Tic-free intervals are difficult to identify and do not last longer than 5-10 minutes at most.

Motor Tics = Phonic Tics =

Within the last year:
2. How forceful were the tics? Mild tics may not be visible and are typically not noticed by others because of their minimal intensity. On the other extreme, severe tics are extremely forceful and exaggerated in expression, call attention to the child with Tourette and may result in risk of physical injury because of their forceful expression. In between are tics of mild, moderate, or marked intensity.

0 = Absent. No evidence of tics.

1 = Minimal forcefulness. Tics may not be visible or audible to others and are typically not noticed or heard by others because of their minimal intensity.

2 = Mild forcefulness. Tics are not more forceful or louder than comparable voluntary actions or utterances and are typically not noticed because of their mild intensity.

3 = Moderate forcefulness. Tics are more forceful than comparable voluntary actions or utterances but are not outside the range of normal expression for comparable voluntary actions or utterances. They may call attention to the child because of their forceful or loud character.

4 = Marked forcefulness. Tics are more forceful or louder than comparable voluntary actions or utterances and typically have an "exaggerated" character. Such tics frequently call attention to the child because of their exaggerated and forceful or loud character.

5 = Severe forcefulness. Tics are extremely exaggerated and forceful or loud in expression. These tics call attention to the child and may result in risk of physical injury (accidental, provoked, or self-inflicted) because of their forceful expression.

Motor Tics= Phonic Tics =

Within the last year:
3. Did the tics disrupt what your child was trying to do or say?
1 = Never interrupt
2 = Occasionally interrupt
3= Sometimes interrupt
4 = Frequently interrupt
5 = Always interrupt

Motor Tics= Phonic Tics =

Thank you!

Appendix H

Yale-Brown Obsessive Compulsive Scale (Y-BOCS)

OCD Severity
Modified from: 1) Goodman, W.K., Rasmussen, S. A., Price, L. H., Mazure, C., Heninger, G. R., & Charney, D. S. (1989c). 2) http://www.brainphysics.com/ocd/ybocs.html

Below are a number of common problems that children have. Please respond to each item based on your child's behaviour in the last year.

Obsessions are indicated by the following:

- The person has recurrent and persistent thoughts, impulses, and images. They are experienced at some time during the disturbance as intrusive and inappropriate and cause marked anxiety or distress
- The thoughts, impulses, or images are not simply excessive worries about real-life problems
- The person attempts to ignore or suppress such thoughts, impulses, or images or to neutralize them with some other thought or action
- The person recognizes that the obsessive thoughts, impulses, or images are a product of his or her own mind (not imposed from outside as in thought insertion)

Compulsions are indicated by the following:

- The person has repetitive behaviors (e.g., hand washing, ordering, checking) or mental acts (e.g., praying, counting, repeating words silently) that the person feels driven to perform in response to an obsession or according to rules that must be applied rigidly
- The behaviors or mental acts are aimed at preventing some dreaded event or situation; however, these behaviors or mental acts either are not connected in a realistic way with what they are designed to neutralize or prevent, or are clearly excessive.

Obsessions

1. Time spent on obsessions:

0 hrs/day	0-1 hrs/day	1-3 hrs/day	3-8 hrs/day	8+ hrs/day
0	1	2	3	4

2. Interference from obsessions:

None	Mild	Definite but Manageable	Substantial Impairment	Incapacitating
0	1	2	3	4

3. Distress from obsessions:

None	Little	Moderate but Manageable	Severe	Near Constant, Disabling
0	1	2	3	4

4. Resistance to obsessions:

Always Resists	Much Resistance	Some Resistance	Often Yields	Completely Yields
0	1	2	3	4

5. Control over obsessions:

Complete Control	Much Control	Some Control	Little Control	No Control
0	1	2	3	4

Compulsions

1. Time spent on compulsions:

0 hrs/day	0-1 hrs/day	1-3 hrs/day	3-8 hrs/day	8+ hrs/day
0	1	2	3	4

2. Interference from compulsions:

None	Mild	Definite but Manageable	Substantial Impairment	Incapacitating
0	1	2	3	4

3. Distress from compulsions:

None	Little	Moderate but Manageable	Severe	Near Constant, Disabling
0	1	2	3	4

4. Resistance to compulsions:

Always Resists	Much Resistance	Some Resistance	Often Yields	Completely Yields
0	1	2	3	4

5. Control over compulsions:

Complete Control	Much Control	Some Control	Little Control	No Control
0	1	2	3	4

Thank you!

Appendix I

Conners' Parent Rating Scale-Revised-Short Form (CPRS-R-S)

ADHD Severity
Modified from Conners, C.K. (1997).

Below are a number of common problems that children have. Please rate each item according to your child's behaviour in the last year. For each item, ask yourself, "How much of a problem has this been in the last year?" and select the best answer for each one. If never (not at all) you would select 1. If it occurs very often you would select 5. You would select 2, 3, or 4 for ratings in between. Please respond to each item.

Never =1 Occasionally = 2 Sometimes = 3 Often = 4 Very Often = 5

1. Inattentive, easily distracted. **ADHD**
2. Difficulty doing or completing homework.
3. Is always "on the go" or acts as if driven by a motor.
4. Short attention span. **ADHD**
5. Fidgets with hands or feet or squirms in seat. **ADHD**
6. Fails to complete assignments.
7. Hard to control in malls or while grocery shopping.
8. Messy or disorganized at home or school. **ADHD**
9. Needs close supervision to get through assignments.
10. Only attends if it is something he/she is very interested in. **ADHD**
11. Runs about or climbs excessively in situations where it is inappropriate.
12. Distractibility or attention span is a problem. **ADHD**
13. Avoids, expresses reluctance about, or has difficulties engaging in tasks that require sustained mental effort (such as schoolwork or homework) **ADHD**
14. Restless in the "squirmy" sense.
15. Has trouble concentrating in class. **ADHD**
16. Has difficulty waiting in lines or awaiting turn in games or group situations.
17. Leaves seat in classroom or in other situations in which remaining seated is expected. A**DHD**
18. Does not follow through on instructions and fails to finish schoolwork, chores or duties in the workplace (not due to oppositional behaviour or failure to understand instructions). **ADHD**
19. Has difficulty playing or engaging in leisure activities quietly.
20. In the past 12 months, did the above symptoms disrupt what your child was trying to do or say?

1 = Never interrupt
2 = Occasionally interrupt
3 = Sometimes interrupt
4 = Frequently interrupt
5 = Always interrupt

Appendix J

Overt Aggression Scale (OAS)

Rage Severity
Modified from Silver, J.M., & Yudofsky, S. C. (1991).

Below are a number of common problems that children have. Please respond to each item based on your child's behaviour in the last year.

Experienced in the last year?

Verbal Aggression

1. Makes loud noises, shouts angrily. Yes No
2. Yells mild personal insults, e.g. "You're stupid." Yes No
3. Curses viciously, uses foul language in anger, makes moderate threats to others or self. Yes No
4. Makes clear threats of violence towards others or self ("I'm going to kill you") or requests to help to control self. Yes No

Physical Aggression Against Objects

5. Slams door, scatters clothing, makes a mess. Yes No
6. Throws objects down, kicks furniture without scratching it or making marks in the wall. Yes No
7. Breaks objects, kicks in walls, smashes windows. Yes No
8. Sets fires, throws objects dangerously. Yes No

Physical Aggression Against Self

9. Picks or scratches skin, hits self, pulls hair (with no or minor injury only). Yes No
10. Bangs head, hits fist into objects, throws self onto floor or into objects (hurts self without serious injury). Yes No
11. Small cuts or bruises, minor burns. Yes No
12. Mutilates self, causes deep cuts, bites that bleed, internal injury, fracture, loss of consciousness, loss of teeth. Yes No

Physical Aggression Against Other People

13. Makes threatening gestures, swings at people, grabs at clothes. Yes No
14. Strikes, kicks, pushes, pulls hair (without injury to them). Yes No
15. Attacks others, causing mild to moderate physical injury (bruises, sprain welts). Yes No

16. Attacks others, causing severe physical injury (broken bones, deep lacerations, internal injury). Yes No
Yes

Thank you!

Appendix K

Sibling Inventory of Differential Experience (SIDE) - Healthy Sibling Version

Child-Parent Relationship
Modified from Daniels, D., & Plomin, R. (1984).

This questionnaire will ask how your mother has interacted with you and your sibling without Tourette. We would like you to compare yourself to your sibling. For each question, think about what causes differences between you and your brother or sister. For the entire questionnaire, think about your experience in the last 12 months.

Select the appropriate option for each question (1, 2, 3, 4, or 5). No item will apply in every situation. Please answer quickly and honestly. There are no right or wrong answers. It should take about 10 minutes to complete this questionnaire. Please avoid circling "3" or leaving the question blank whenever possible.

Example: If a question asks you if your mother has been stricter with you or your sibling without Tourette, if your mother has been more strict with your sibling than with you, you should select "1". If your mother has been much more strict with you, select 5. Select 3 if your mother has been equally strict with both of you.

1. My mother expects her children to do work around the house.

Sibling Much More		Same		Me Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair?

2. My mother expects her children to keep their rooms clean.

Sibling Much More		Same		Me Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

3. My mother asks her children for help.

Sibling Much More		Same		Me Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

4. My mother has been strict with us.

Toward Sibling Much More		Same		Toward Me Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

5. My mother has been proud of the things we have done.

Toward Sibling Much More		Same		Toward Me Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

6. My mother has enjoyed doing things with us.

Toward Sibling Much More		Same		Toward Me Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

7. My mother has been sensitive to what we think and feel.

Toward Sibling Much More		Same		Toward Me Much More
1	2	3	4	5

Is this fair?

Very Fair Neither Fair Nor Unfair Very Unfair

1 2 3 4 5

Explain why you think this is fair or unfair.

8. My mother has punished us for our misbehaviour.

Toward Sibling Same Toward Me Much More Much More

1 2 3 4 5

Is this fair?

Very Fair Neither Fair Nor Unfair Very Unfair

1 2 3 4 5

Explain why you think this is fair or unfair.

9. My mother has shown interest in the things we like to do.

Toward Sibling Much More Same Toward Me Much More

1 2 3 4 5

Is this fair?

Very Fair Neither Fair Nor Unfair Very Unfair

1 2 3 4 5

Explain why you think this is fair or unfair.

10. My mother has blamed us for what another family member did.

Toward Sibling Much More Same Toward Me Much More

1 2 3 4 5

Is this fair?

Very Fair Neither Fair Nor Unfair Very Unfair

1 2 3 4 5

Explain why you think this is fair or unfair.

11. My mother has tended to favour one of us.

Toward Sibling Much More Same Toward Me Much More

1 2 3 4 5

Is this fair?

Very Fair Neither Fair Nor Unfair Very Unfair

1 2 3 4 5

Explain why you think this is fair or unfair.

12. My mother has disciplined us.

Toward Sibling Much More		Same		Toward Me Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

13. My mother spends time...

With my sibling much more		Neither child more than the other		With me much more
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

14. How well did you understand the questions?

Very Well	Well	Somewhat	A Little	Not at All
1	2	3	4	5

15. How often did your parent(s) help you in filling out this questionnaire?

All the Time	Often	Sometimes	Rarely	Never
1	2	3	4	5

Thank you!

Appendix L

Family Adaptability and Cohesion Evaluation Scale-II (FACES-II)
Healthy Sibling Version

Family Relationship
Modified from Olson, D.H.; Bell, R., & Portner, J., (1992).

Please choose one of the five options (Almost never, Once in a while, Sometimes, Frequently, Almost always) for each question based on your experience in the last year. Select one of the numbers beside each question, 1, 2, 3, 4, or 5.

Almost Never = 1 Once in a While = 2 Sometimes = 3 Frequently = 4 Almost Always = 5

+ coh 1. Family members are supportive of each other during difficult times.

+ ada 2. In our family, it is easy for everyone to express his/her opinion.

- coh 3. It is easier to discuss problems with people outside the family than with other family members.

+ ada 4. Each family member has input regarding major family decisions.

+ coh 5. Our family gathers together in the same room.

+ ada 6. Children have a say in their discipline.

+ coh 7. Our family does things together.

+ ada 8. Family members discuss problems and feel good about the solutions.

- coh 9. In our family, everyone goes his/her own way.

+ ada 10. We shift household responsibilities from person to person.

+ coh 11. Family members know each other's close friends.

+ ada 12. It is hard to know what the rules are in our family.

+ coh 13. Family members consult other family members on personal decisions.

+ ada 14. Family members say what they want.

- coh 15. We have difficulty thinking of things to do as a family.

+ ada 16. In solving problems, the children's suggestions are followed.

+ coh 17. Family members feel very close to each other.

+ ada 18. Discipline is fair in our family.

- coh 19. Family members feel closer to people outside the family than to other family members.

+ ada 20. Our family tries new ways of dealing with problems.

+ coh 21. Family members go along with what family decides to do.

+ ada 22. In our family, everyone shares responsibilities.

+ coh 23. Family members like to spend their free time with each other.

- ada 24. It is difficult to get a rule changed in our family.

- coh 25. Family members avoid each other at home.

+ ada 26. When problems arise, we compromise.

+ coh 27. We approve of each other's friends.

- ada 28. Family members are afraid to say what is on their mind.

- coh 29. Family members pair up rather than do things as a total family.

+ coh 30. Family members share interests and hobbies with each other.

31. How well did you understand the questions?

Very Well	Well	Somewhat	A Little	Not at All
1	2	3	4	5

32. How often did your parent(s) help you in filling out this questionnaire?

All the Time	Often	Sometimes	Rarely	Never
1	2	3	4	5

Thank you!

Appendix M

Sibling Relationship Questionnaire (SRQ) - Healthy Sibling Version

Sibling Relationship
Modified from Furman, W., & Buhrmester, D. (1985).

Please choose one of the five options (Hardly At All, Not Too Much, Somewhat, Very Much, Extremely Much) for each question. Select one of the numbers 1, 2, 3, 4, or 5 beside each question considering your relationship with your sibling without Tourette in the last year.

Hardly At All	1
Not Too Much	2
Somewhat	3
Very Much	4
Extremely Much	5

1. Some siblings do nice things for each other a lot, while other siblings do nice things for each other a little. How much do both you and your sibling do nice things for each other. (warmth)

2. Some siblings care about each other a lot while other siblings don't care about each other that much. How much do you and your sibling care about each other? (warmth)

3. How much do you and your sibling go places and do things together? (warmth)

4. How much do you and your sibling insult and call each other names? (conflict)

5. How much do you and your sibling like the same things? (warmth)

6. How much do you and your sibling tell each other everything? (warmth)

7. Some siblings try to out-do or beat each other at things a lot, while other siblings try to out-do each other a little. How much do you and your sibling try to out-do each other at things? (conflict)

8. How much do you admire and respect your sibling? (warmth)

9. How much does your sibling admire and respect you? (warmth)

10. How much do you and your sibling disagree and quarrel with each other? (conflict)

11. Some siblings cooperate a lot, while other siblings cooperate a little. How much do you and your sibling cooperate with each other? (warmth)

12. How much do you and your sibling love each other? (warmth)

13. Some siblings play around and have fun with each other a lot, while other siblings play around and have fun with each other a little. How much do you and your sibling play around and have fun with each other? (warmth)

14. How much do you and your sibling mean (are important) to each other? (warmth)

15. How much do you and your sibling have in common? (warmth)

16. How much do you and your sibling share secrets and private feelings? (warmth)

17. How much do you and your sibling compete with each other? (conflict)

18. How much do you look up to and feel proud of your sibling? (warmth)

19. How much does your sibling look up to and feel proud of you? (warmth)

20. How much do you and your sibling get mad and get in arguments with each other? (conflict)

21. How much do both you and your sibling share with each other? (warmth)

22. How much is there a strong feeling of affection (love) between you and your sibling? (warmth)

23. Some kids spend lots of time with their siblings, while others don't spend so much. How much free time do you and your sibling spend together? (warmth)

24. How much do you and your sibling bug and pick on each other in mean ways? (conflict)

25. How much are you and your sibling alike? (warmth)

26. How much do you and your sibling tell each other things you don't want other people to know? (warmth)

27. How much do you and your sibling try to do things better than each other? (conflict)

28. How much do you think highly of your sibling? (warmth)

29. How much does your sibling think highly of you? (warmth)

30. How much do you and your sibling argue with each other? (conflict)

31. How well did you understand the questions?

Very Well	Well	Somewhat	A Little	Not at All
1	2	3	4	5

32. How often did your parent(s) help you in filling out this questionnaire?

All the Time	Often	Sometimes	Rarely	Never
1	2	3	4	5

Thank you!

Appendix N

Communication Questionnaire - Healthy Sibling Version

Communication

1. How well do you know what Tourette is?

Very Well	Well	Somewhat	A Little	Not at All
1	2	3	4	5

If you know Tourette very well, well, some what, or a little, can you explain it in no more than three lines.

2. How did you learn about Tourette?
Please explain in no more than three lines.

3. Did your parents explain Tourette to you?

Very Frequently	Often	Sometimes	Rarely	Never
1	2	3	4	5

If your answer is negative (never) please explain why you think your parents did not explain Tourette to you, and continue with question "7".

If your answer to question 3 is very frequently, often, sometimes, or rarely, please answer questions 4-6.

4. How well did your parents explain Tourette to you?

Very Well	Well	Somewhat	A Little	Not at All
1	2	3	4	5

5. What type of discussions did you have with your parents when you discussed your sibling's Tourette? (You can choose one or both of the following.)

a. Constructive (You did not have fights, it was a friendly discussion, you found it useful)

Very Frequently	Often	Sometimes	Rarely	Never
1	2	3	4	5

b. Confrontational (You fought, and could not accept their explanations, you found it useless)

Very Frequently	Often	Sometimes	Rarely	Never
1	2	3	4	5

c. Can you explain your discussions with your parents in no more than 3 lines.

6. How much has your parents' explanation about Tourette affected your relationship with your sibling with Tourette? It has made your relationship:

Much Better	Better	No Change	Worse	Much Worse
1	2	3	4	5

7. Please indicate the extent to which you agree or disagree with the following statement. "I wish to talk more about Tourette with my parents?"

Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
1	2	3	4	5

If your answer is 1, 2, 3 or 4 please explain what do you wish to speak about (in no more than 3 lines).

8. How well did you understand the questions?

Very Well	Well	Somewhat	A Little	Not at All
1	2	3	4	5

9. How often did your parent(s) help you in filling out this questionnaire?

All the Time	Often	Sometimes	Rarely	Never
1	2	3	4	5

Thank you!

Appendix O

Sibling Inventory of Differential Experience (SIDE) – Parent Version

Child-Parent Relationship
Modified from Daniels, D., & Plomin, R., (1984).

This questionnaire is designed to ask you about two of your children (one your child with Tourette and the other healthy child, closest in age to your child with Tourette). The questionnaire is designed to ask you about what makes these two children of yours different from each other as they are growing up. We would like you to compare them together. For each question, think about what causes differences between them. We will ask you how you have interacted with them. For the entire questionnaire, think about your experience in the last 12 months.

Select the appropriate option for each question (1, 2, 3, 4, or 5). No item will apply in every situation, but try to consider what usually has happened between your two children. Please answer quickly and honestly. There are no right or wrong answers. It should take about 10 minutes to complete this questionnaire.

Example: if a question asks you if you have been stricter with the child with Tourette or your child without Tourette, if you have been more strict with your child with Tourette than with your child without Tourette, you should select "1". If you have been much more strict with your child without Tourette, select "5". Select "3" if you have been equally strict with both of them. Please avoid circling "3" or leaving the question blank whenever possible.

1. I expect my children to do work around the house.

Child With TS More		Same		Child Without TS More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair?

2. I expect my children to keep their rooms clean.

Child With TS More		Same		Child Without TS More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

3. I ask my children for help.

Child With TS More		Same		Child Without TS More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

4. I have been strict with the children.

Toward Child With TS Much More		Same		Toward Child Without TS Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

5. I have been proud of the things the children have done.

Toward Child With TS Much More		Same		Toward Child Without TS Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

6. I have enjoyed doing things with the children.

Toward Child With TS Much More		Same		Toward Child Without TS Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

7. I have been sensitive to what the children think and feel.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

8. I have punished the children for their misbehaviour.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

9. I have shown interest in the things the children like to do.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

10. I have blamed the children for what another family member has done.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

11. I have tended to favour one of the children.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

12. I have disciplined the children.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

13. I spend time...

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

Thank you!

Child-Parent Relationship
Modified from Daniels, D., & Plomin, R., (1984).

This questionnaire is designed to ask you about two of your children (one your child with Tourette and the other healthy child, closest in age to your child with Tourette). The questionnaire is designed to ask you about what makes these two children of yours different from each other as they are growing up. We would like you to compare them together. For each question, think about what causes differences between them. We will ask you how their other parent has interacted with them. For the entire questionnaire, think about his/her experience in the last 12 months.

Select the appropriate option for each question (1, 2, 3, 4, or 5). No item will apply in every situation, but try to consider what usually has happened between your two children. Please answer quickly and honestly. There are no right or wrong answers. It should take about 10 minutes to complete this questionnaire.

Example: If a question asks you if the other parent has been stricter with the child with Tourette or the child without Tourette, if the other parent has been more strict with your child with Tourette than with your child without Tourette, you should select "1". If the other parent has been much more strict with your child without Tourette, select "5". Select "3" if the other parent has been equally strict with both of them. Please avoid circling "3" or leaving the question blank whenever possible.

1. **The other parent expects the children to do work around the house.**

Child With TS More		Same		Child Without TS More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

2. The other parent expects the children to keep their rooms clean?

Child With TS More		Same		Child Without TS More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

3. The other parent asks the children for help.

Child With TS More		Same		Child Without TS More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

4. The other parent has been strict with the children.

Toward Child With TS Much More		Same		Toward Child Without TS Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

5**. The other parent has been proud of the things the children have done.**

Toward Child With TS Much More		Same		Toward Child Without TS Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

6. The other parent has enjoyed doing things with the children.

Toward Child With TS Much More		Same		Toward Child Without TS Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

7. The other parent has been sensitive to what the children think and feel.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

8. The other parent has punished the children for their misbehaviour.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

9. The other parent has shown interest in the things the children like to do.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

10. The other parent has blamed the children for what another family member has done.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

11. The other parent has tended to favour one of the children.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

12. The other parent has disciplined the children.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

13. The other parent spends time.

Toward Child With TS		Same		Toward Child Without TS
Much More				Much More
1	2	3	4	5

Is this fair?

Very Fair		Neither Fair Nor Unfair		Very Unfair
1	2	3	4	5

Explain why you think this is fair or unfair.

Thank you!

Appendix P

Family Adaptability and Cohesion Evaluation Scale-II (FACES-II)
Parent Version

Family Relationship
Modified from Olson, D.H.; Bell, R., & Portner, J., (1992).

Please choose one of the five options (Almost never, Once in a while, Sometimes, Frequently, Almost always) for each question based on your experience in the last year. Select one of the numbers beside each question, 1, 2, 3, 4, or 5.

Almost Never = 1 Once in a While = 2 Sometimes = 3 Frequently = 4 Almost Always = 5

1. Family members are supportive of each other during difficult times.

2. In our family, it is easy for everyone to express his/her opinion.

3. It is easier to discuss problems with people outside the family than with other family members.

4. Each family member has input regarding major family decisions.

5. Our family gathers together in the same room.

6. Children have a say in their discipline.

7. Our family does things together.

8. Family members discuss problems and feel good about the solutions.

9. In our family, everyone goes his/her own way.

10. We shift household responsibilities from person to person.

11. Family members know each other's close friends.

12. It is hard to know what the rules are in our family.

13. Family members consult other family members on personal decisions.

14. Family members say what they want.

15. We have difficulty thinking of things to do as a family.

16. In solving problems, the children's suggestions are followed.

17. Family members feel very close to each other.

18. Discipline is fair in our family.

19. Family members feel closer to people outside the family than to other family members.

20. Our family tries new ways of dealing with problems.

21. Family members go along with what family decides to do.

22. In our family, everyone shares responsibilities.

23. Family members like to spend their free times with each other.

24. It is difficult to get a rule changed in our family.

25. Family members avoid each other at home.

26. When problems arise, we compromise.

27. We approve of each other's friends.

28. Family members are afraid to say what is on their mind.

29. Family members pair up rather than do things as a total family.

30. Family members share interests and hobbies with each other.

Thank you!

Appendix Q

Sibling Relationship Questionnaire (SRQ) – Parent Version

Sibling Relationship
Modified from Furman, W., & Buhrmester, D., (1985).

Please choose one of the five numbers representing five options (Hardly At All, Not Too Much, Somewhat, Very Much, Extremely Much) for each question. Select one of the numbers 1, 2, 3, 4, or 5 beside each question considering the relationship between your child without Tourette and their sibling with Tourette in the last year.

Hardly At All	1
Not Too Much	2
Somewhat	3
Very Much	4
Extremely Much	5

1. Some siblings do nice things for each other a lot, while other siblings do nice things for each other a little. How much do both of your children (with TS and without TS) do nice things for each other?

2. Some siblings care about each other a lot while other siblings don't care about each other that much. How much does your child without TS and his/her sibling with TS care about each other?

3. How much do your child without TS and his/her sibling with TS go places and do things together?

4. How much do your child without TS and his/her sibling with TS insult and call each other names?

5. How much do your child without TS and his/her sibling with TS like the same things?

6. How much do your child without TS and his/her sibling with TS tell each other everything?

7. Some siblings try to out-do or beat each other at things a lot, while other siblings try to out-do each other a little. How much do your child without TS and his/her sibling with TS try to out-do each other at things?

8. How much does your child with TS admire and respect his/her sibling without TS?

9. How much does your child without TS admire and respect his/her sibling with TS?

10. How much do your child without TS and his/her sibling with TS disagree and quarrel with each other?

11. Some sibling cooperate a lot, while other siblings cooperate a little. How much do your child without TS and his/her sibling with TS cooperate with each other?

12. How much do your child without TS and his/her sibling with TS love each other?

13. Some siblings play around and have fun with each other a lot, while other siblings play around and have fun with each other a little. How much do your child without TS and his/her sibling with TS play around and have fun with each other?

14. How much do your child without TS and his/her sibling with TS mean (are important) to each other?

15. How much do your child without TS and his/her sibling with TS have in common?

16. How much do your child with TS and his/her sibling share secrets and private feelings?

17. How much do your child without TS and his/her sibling with TS share secrets and private feelings?

18. How much does your child with TS look up to and feel proud of his/her sibling without TS?

19. How much does your child without TS look up to and feel proud of his/her sibling with TS?

20. How much do your child without TS and his/her sibling with TS get mad and get in arguments with each other?

21. How much does your child without TS and his/her sibling with TS share with each other?

22. How much is there a strong feeling of affection (love) between your child without TS and your child with TS?

23. Some kids spend lots of time with their siblings, while others don't spend so much. How much free time do your child without TS and his/her sibling with TS spend together?

24. How much do your child without TS and his/her sibling with TS bug and pick on each other in mean ways?

25. How much are your child without TS and his/her sibling with TS alike?

26. How much do your child without TS and his/her sibling with TS tell each other things they don't want other people to know?

27. How much does your child without TS think highly of his/her sibling with TS?

28. How much does your child with TS think highly of his/her sibling without TS?

29. How much does your child without TS think highly of his/her sibling with TS?

30. How much do your child without TS and his/her sibling with TS argue with each other?

Thank you!

Appendix R

Communication Questionnaire - Parent Version

Communication

1. How well do you know what Tourette is?

Very Well	Well	Somewhat	A Little	Not at All
1	2	3	4	5

If you know Tourette very well, well, some what, or a little, can you explain it in no more than three lines.

2. How did you learn about Tourette?
Please explain in no more than three lines.

3. Did you explain Tourette to you child without Tourette?

Very Frequently	Often	Sometimes	Rarely	Never
1	2	3	4	5

If your answer is "Never" please explain why you did not explain Tourette to him/her?

If your answer to question 3 is "Never" please continue with question 7.
If your answer to question 3 is "Very Frequently, Often, Sometimes, or Rarely" please answer the following questions.

4. What type of discussions did you have with your child without Tourette when you discussed his/her sibling's Tourette? (You can choose one or both of the following)

a. Constructive (You did not have fights, it was a friendly discussion, you found it useful)

Very Frequently	Often	Sometimes	Rarely	Never
1	2	3	4	5

b. Confrontational (You fought, and could not accept their explanations, you found it useless)

Very Frequently	Often	Sometimes	Rarely	Never
1	2	3	4	5

c. Can you explain your discussions with your child without Tourette in no more than 3 lines.

5. How much have your discussions and explanations about Tourette affected your relationship with your child without Tourette? It has made your relationship:

Much Better	Better	No Change	Worse	Much Worse
1	2	3	4	5

6. How much have your discussions and explanations about Tourette affected the relationship between your child without Tourette and his/her sibling with TS? It has made their relationship:

Much Better	Better	No Change	Worse	Much Worse
1	2	3	4	5

7. Please indicate the extent to which you agree or disagree with the following statement. "I wish to talk more about Tourette to my child without Tourette"

Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
1	2	3	4	5

If your response is 1, 2, 3, or 4, please explain what you wish to speak about with your child without Tourette, in no more than 3 lines.

Thank you!

Appendix S

Demographic Questionnaire

Demographic Information

Every attempt is made to preserve the confidentiality of the information you will provide. To accomplish this, on the next page you will be assigned a family ID. Please record and keep your family ID. This ID will allow you to continue this survey at another time. If you somehow lose your family ID you will not be able to continue the survey at a later time, but will have to start the survey again. If you wish you can provide us with your email address below, which can then be used to recover your family ID in the event that you lose it.

E-mail Address: (optional)

Please answer the following questions regarding you and your family. The first section asks general questions about your child with Tourette and the second section asks you general questions about your child without Tourette who is participating in this study.

General Questions

Are you the mother or father of the child with Tourette? Mother Father

Highest education received by the father of the child with Tourette:
Less than 7 years of school
Junior high school
Partial high school
High school graduate
Technical school
Partial college
College graduate
Professional degree

Current occupation of the father of the child with Tourette:
Highest education received by the mother of the child with Tourette:
Less than 7 years of school
Junior high school
Partial high school
High school graduate
Technical school
Partial college
College graduate
Professional degree

Current occupation of the mother of the child with Tourette:

Primary language spoken at home:

Secondary language:

About your child with Tourette

Gender of the child with Tourette: Female Male

Birth date of the child with Tourette: Year Month

Please indicate which (if any) of the following disorders the child with Tourette has been diagnosed with:
Obsessive-Compulsive Disorder
Attention Deficit Hyperactivity Disorder
Rage
If other, specify:

If yes to any of the above, by whom was the child diagnosed?
Family Physician
Pediatrician
Psychiatrist
Psychologist
Neurologist
Other, if other, specify:

Who lives in the same household with the child with Tourette?

1. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

2. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

3. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

4. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

5. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

6. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

The child with Tourette's highest education received:
Less than 7 years of school
Junior high school
Partial high school
High school graduate
Technical school
Partial college
College graduate
Professional degree

Currently in special education? Yes No

Is the child with Tourette married? Yes No

Current occupation of the child with Tourette (if any):

If the child with Tourette is married, highest education received by spouse:
Less than 7 years of school
Junior high school
Partial high school
High school graduate
Technical school
Partial college
College graduate
Professional degree

If the child with Tourette is married, spouse's current occupation (if any):

About your child without Tourette

Gender of the child without Tourette: Female Male

Birth date of the child without Tourette: Year Month

Who lives in the same household with the child without Tourette? Is this the same as the information entered above for the child with Tourette? Yes No

If yes , you may skip filling in the table below.

1. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

2. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

3. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

4. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

5. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

6. Gender: Female Male
Birth date: Year Month
Relationship to the child with Tourette (e.g., mother, father, sister, etc.)

The child without Tourette's highest education received:
Less than 7 years of school
Junior high school
Partial high school
High school graduate
Technical school
Partial college
College graduate
Professional degree

Is the child without Tourette married? Yes No

Current occupation of the child without Tourette (if any):

If the child without Tourette is married, highest education received by spouse:
Less than 7 years of school
Junior high school
Partial high school

High school graduate
Technical school
Partial college
College graduate
Professional degree

If the child without Tourette is married, spouse's current occupation (if any):