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Quality of Life in Gilles de la Tourette Syndrome

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This project is my own work; any help is acknowledged, and all sources are correctly cited and referenced. Signed: _____ Date: _____

Quality of Life in Gilles de la Tourette Syndrome

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Abstract: The objective of this study is to investigate the quality of life (QOL) in Tourette syndrome (TS) specifically the extent to which tic severity, obsessive-compulsive disorder (OCD), depression, anxiety and attention deficit hyperactivity disorder (ADHD) relate to QOL in a sample of adults with TS. Forty six adults with TS participated in the study, completing questionnaires which assessed the impact of the above variables on QOL. This was the first study to measure QOL in TS using a specific health-related QOL instrument (GTS-QOL scale) designed to assess the complex characteristics of TS. Tic severity and OCD were assessed with the Motor tic, Obsessions and compulsions, Vocal tic Evaluation Survey (MOVES). Other scales included the Hospital Anxiety and Depression (HAD) scale, which screened anxiety and depression, and the Adult ADHD Self-Report Scale (ASRS v1.1) Screener, measuring attention deficit hyperactivity disorder. The results showed that depression and tic severity were strong predictors of QOL in the TS sample, but OCD, anxiety and ADHD were not. In conclusion, this study emphasises the impact of tic severity and comorbid disorders on the QOL of adults with TS.

Key Words: Tourette syndrome, quality of life, comorbidity.

INTRODUCTION

Tourette Syndrome (TS) is a neuropsychiatric condition with a complex aetiology that has been the focus of a growing body of literature. In spite of the fact that the aetiology has not been fully determined, genetic and psychosocial characteristics are known to be associated with its development^{1 2}. The clinical features of TS, which has its onset in childhood, are characterised by the presence of motor and vocal tics occurring for longer than a year³. Motor and phonic tics, which are the essential component of TS, although easily observed, are widely defined (involuntary, sudden, rapid, repetitive, stereotyped) movements or articulations⁴. In addition, tics are expressed in a diversity of forms, presenting different degrees of

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severity and duration, and there are no two TS patients displaying the same symptom⁵. Tics occur with deeply subjective experiences that the person perceives within him or herself, being referred to as ‘premonitory urges’⁶. Moreover, motor and vocal tics may fluctuate in type, location, frequency, length and intensity, and they can be worsened through stress, anxiety and tiredness⁷.

According to the DSM-IV-TR diagnostic criteria, the onset of TS takes place before the age of eighteen years and is not caused by the effects of a substance or a general medical condition⁸. Motor tics may be simple, involving rapid contraction of one or more muscles, or complex, where touching, squatting, knee bends and twirling while walking may occur⁹. The vocal tics are formed by words or sounds such as clicks, grunts, yelps, barks, sniffs and coughs¹⁰. Further features may include echopraxia (repeating others’ actions), palilalia (repeating what oneself says) and echophenomena (copying what other people say or do). Coprolalia (a vocal tic involving inappropriate, involuntary expression of obscenities) occurs in only 10-15% of TS patients¹¹. For example, in a study within a paediatric clinic where 112 patients were assessed, only 8% of the TS patients presented coprolalia¹². Motor tics typically begin between the ages of three and eight years with the presentation of periods of extreme eye blinking or another facial movement¹³. Although phonic tics, such as intensive sniffing or throat clearing, may begin at three years of age, they occur several years after the onset of motor tics¹⁴. In simple cases, motor and vocal tics reach their highest levels early in the second decade and many patients show a considerable reduction by the age of 19 to 20¹⁵.

The first case of TS was documented by Itard in 1825, describing the Marquise de Dampierre, and later by Georges Gilles de la Tourette in 1885¹⁶. In his paper, Itard discusses seven men and three women who displayed uncontrolled movements of their legs, hands and voices¹⁷. Itard’s goal was to investigate the symptoms, origins and treatment for these involuntary movements and not to name a new disorder. However, his last observation was later considered the first clinical presentation of TS. In his report he described a French noblewoman, who was a member of high society who presented coprolalia. This woman lived until 1884 and was seen by the eminent neurologist Professor Jean-Martin Charcot who, later approved the diagnosis and renamed the illness in honour of Gilles de la Tourette¹⁸.

Sixty years after Itard reported this case Gilles de la Tourette chose this example as his first illustration of the illness that he categorized as ‘maladie des tics’¹⁹. This case can be found in various nineteenth and twentieth century medical literature and in the emerging field of neurology²⁰. In the UK the first case, reported by William Drage in 1663, may have been Mary Hall of Gadsden²¹. Hughlings Jackson described a patient presenting TS in the London Hospital Gazette in 1884, a year before Gilles de la Tourette reported his nine patients presenting chronic tic disorders²².

TS was considered a rare condition for many years and only case reports could be found in the literature²³. It was regarded as a psychological disorder between the first initial report in the late 19th century and the mid-1960s²⁴. Only when it was found that antipsychotic medications helped alleviate tic severity in the mid-1960s, was TS regarded as neurologic²⁵. Before the 1960s no published reports of conclusive TS cases could be found outside Western culture²⁶. In 1980 psychiatrists in several countries were still unable to accurately diagnose TS²⁷. Abuzzahab and Anderson²⁸ conducted the first cross-cultural analysis of TS, reporting 430 case reports, mainly from North American and European countries. Seventy-one per cent of the sample was male and the average onset age was between five and 10 years of age. The most frequent motor tics were facial movements (92%), arms tics (78%), and phonic tics including inarticulate vocal expressions (65%), coprolalia (58%), and echolalia (23%). In addition, obsessive-compulsive disorder (OCD) was the most frequent comorbid psychiatric disorder. In recent years, however, the literature on TS has been extensive, with considerable cohorts of TS patients and scientifically rigidly accurate investigations being widely reported²⁹. Therefore, suggestions that TS was viewed as a rare disorder of psychogenic origin have been replaced by evidence showing a common disorder having a genetic cause with neurotransmitter abnormalities³⁰.

More recently, a study by Kurlan et al.³¹ in the United States and Manson et al.³² in the United Kingdom, and 12 other large studies regarding the prevalence of TS, showed figures of between 0.4 % to 3.8% for people aged between five and 18 years. It has been suggested that the overall international figure for the prevalence of TS is 1%³³. However, there are communities such as African-American and sub-Saharan black African where TS has rarely been reported³⁴. When considering studies of children with special educational needs, the prevalence of TS has been found to be

remarkably high³⁵. For example, a study by Comings and colleagues³⁶ assessed 3,034 pupils who had been referred for psycho-educational evaluation in three schools in California over a period of two years. They suggested that of all the children in special education classes 12% presented TS and that 28% belonged to a wider tic diagnostic category. In this context, TS has been found to be universal, not bound to a specific race or nationality, and its clinical picture does seem to be independent of culture³⁷. In addition, according to the study of prevalence and epidemiology of Robertson³⁸, TS is found more in males than females, with a ratio of approximately 4:1.

It must be noted that the findings about prevalence are contradictory as physicians and researchers often disagree about which symptoms should be included or excluded in the definition of Tourette³⁹. The reason for this is the fact that TS is considered a syndrome rather than a disease, and the cause of a syndrome remains unknown⁴⁰. Moreover, with syndromes such as Tourette, schizophrenia, and chronic fatigue, a diagnosis relies on the recognition of a number of possible combinations of signs and symptoms that a person must manifest over a specific length of time, and these numbers may vary from physician to physician. In Tourette the signs and symptoms have been grouped together to fit a spectrum, where one cause may arise through a series of different symptoms⁴¹. On the other hand, since the underlying pathology of TS remains unknown, these signs and symptoms could develop from a variety of fundamentally different causes⁴².

The psychopathology of TS is more widespread than once thought and problems associated with TS are more commonly recognised⁴³. Therefore, in addition to tic symptoms there is a substantial amount of research emphasising that a spectrum of other movements in patients with TS may be present^{44 45}. These may be drug-induced movements such as akathisia, dystonia, chorea, parkinsonism, or movements associated with co-occurring conditions such as OCD and attention deficit hyperactivity disorder (ADHD)⁴⁶. It has been suggested that these two comorbid conditions have a genetic relationship to TS⁴⁷. The presence of TS and these comorbid disorders is frequently referred to as Tourette syndrome plus⁴⁸. It is important to note that anxiety disorders, mood disorders and behavioural problems have a controversial genetic link to TS. Walkup and colleagues suggest that there are two widespread

hypotheses concerning the kind of the relationship of comorbid disorders; first TS and coexisting conditions might be elements of a single complex syndrome that have a common single underlying aetiology. On the other hand, a TS spectrum of symptoms might exist that incorporates OCD and ADHD; based on this, the relationship probably comprises features of both of these two theories⁴⁹.

A cross-cultural review of case reports, clinical investigations and epidemiological studies of thirty-nine case studies between 1963 and 1992 by Staley and colleagues⁵⁰ found that TS was linked with depression (31%), OCD (26%), anxiety (15%), and ADHD (3%). Further associated conditions to TS were also examined in the analysis of case reports. The most commonly occurring characteristics identified in the cross-cultural case reports consisted of educational difficulties (36%) which included interference with studies, poor attendance and dropping out of school, and interpersonal conflicts (36%) where social isolation, difficulty in making friends and family disturbance were the most frequently reported issues. In 18% of the cases aggressive behaviour was presented and in 10% of the sample self-injurious behaviour was noted. Lastly, sleep problems such as insomnia and difficulties in maintaining a job were found in 8% of the reports.

It is important to consider the individual associated behaviours and psychopathologies experienced in TS since a number of controlled studies making use of standardised rating scales have been found in the literature. This, in turn, may shed light on the precise nature of the pathologies and their link to TS⁵¹. In addition, a small number of individuals with TS in clinics present no other problems⁵². For example, a study of an international sample of 3,500 individuals with TS, 42% from Canada, 27% from the United States and 31% from outside North America, investigated a large set of clinical material collected at 65 sites from 22 countries during a period of five years⁵³. Their findings showed that only 12% of individuals with TS presented no comorbidity. The most frequently encountered coexisting conditions were ADHD (60%) obsessive-compulsive behaviour (32%), OCD (27%), mood (affective) disorders (20%) and anxiety disorders (18%). Individuals with comorbidity also displayed high levels of anger control problems, sleep problems, coprolalia and self-injurious behaviour.

ADHD is the most frequently reported coexisting diagnosis in children and adolescents with tic disorders⁵⁴. This disorder is marked by symptoms of inattention, impulsivity, hyperactivity, difficulty in concentrating and poor organisational skills⁵⁵. ADHD in connection with TS occurs in over half of cases in clinical population and at higher rates when compared with community samples^{56 57}. There is evidence showing that ADHD appears in a large proportion of patients with TS, ranging from 21% to 90% of clinic populations⁵⁸. A study examining people recruited into the Israeli Defence force for a period of one year found that the rate of ADHD in individuals with TS was 8.3% compared with a prevalence of 3.9% in individuals without TS⁵⁹. There are various hypotheses explaining the underlying reasons for the relationship of ADHD and TS comorbidity⁶⁰. The exact reasons for this relationship are complex and have generated controversy. However, as claimed by Robertson, ADHD is common in the TS population and it seems that it may be found even in mild cases identified in epidemiological studies⁶¹.

Another disorder usually found in people with TS is OCD, which is characterised by obsessions (repetitive, stereotyped, intrusive and unwanted thoughts) and compulsions (repetitive, stereotyped, intrusive and unwanted behaviours)⁶². There are multiple lines of evidence suggesting a strong relationship between TS and OCD, both in people with TS and in their family members; this evidence has been shown in phenomenological, genetic and epidemiological studies^{63 64}. In adults with OCD, the course is commonly chronic, including waxing and waning of symptoms (85%) or an advancing deterioration (5% to 10%)⁶⁵. The intrusive thoughts and behaviours may cause individuals considerable distress and affect their ability to carry out daily activities⁶⁶. It has been suggested that about 30% of people with TS present symptoms significantly severe to receive a diagnosis of OCD⁶⁷. There are several studies reporting OCD and OCB (obsessive-compulsive behaviour, which emerges after the onset of tics, generally during early adolescence⁶⁸) to be common and genetically integral⁶⁹.

A further co-occurring disorder commonly found in people with TS is depression. The aetiology of depression involves several factors including genetic and psychosocial variables⁷⁰. There are several case reports, uncontrolled and controlled studies investigating the symptoms of depression in patients with TS⁷¹. For example, a

study examined 90 adult TS patients using rating scales such as the Beck Depression Inventory, the Mood Adjective Checklist and the Crown Crisp Experimental Index; the results showed that on all the measures the scores of TS patients were considerably higher than normative data⁷². Therefore, depression and depressive symptoms appear to be common in TS (13-76% in over 5,000 patients in uncontrolled investigations) and when compared with controls the frequency rate is higher in TS patients⁷³.

Another frequent comorbid disorder found in people with TS is anxiety, which has been often investigated⁷⁴. In a study by Coffey and colleagues of 84 TS patients, it was found that 11 (13%) presented TS with OCD and 16 (19%) had TS with non-OCD anxiety disorder⁷⁵. Comings and Comings investigated the frequency of several behavioural manifestations comparing 47 random normal controls with 246 patients with TS⁷⁶. They found that 16% of the TS patients and none of the normal controls had more than three panic attacks per week; 19% of the TS patients and none of the controls presented phobias which had an impact on their life, and 14% of the TS individuals and 4.2% of controls had both panic attacks and phobias. Thus, it appears that anxiety is common in TS patients; however it is important to note that the precise relationship to TS remains unclear⁷⁷.

In the present context, what should be noted further is that co-occurring psychiatric disorders may take on an additional importance over the course of a patient's life⁷⁸. Tic severity usually peaks between nine and 14 years of age and gradually decreases by young adulthood⁷⁹, whereas co-occurring psychiatric disorders and their consequences usually manifest at a later onset than tics and, if not addressed, may become chronic and linked with increasing disability⁸⁰. It is worth noting, therefore, that tics may be most externally visible, but it is the associated co-occurring disorders that may have the strongest impact on daily functioning (e.g. schooling, social and work functioning)^{81 82}. It is, therefore, claimed that TS and its common coexisting comorbidities have a considerable impact on quality of life for a large number of people in the UK and worldwide⁸³.

Health-related quality of life involves psychosocial factors such as pain, apprehension and restricted mobility, problems in fulfilling personal and family responsibilities, financial burden and weakened cognition; it moves beyond the direct

expression of illness to investigate the patient's personal morbidity, examining the several effects that illnesses and treatments cause in daily life and life satisfaction⁸⁴. There is no precise definition on quality of life (QOL). However, commonly accepted questionnaires used in QOL assessments usually represent one or both operational definitions, which relates to QOL as an individual behaviour or level of functioning or QOL as an individual's understanding of health status or wellbeing⁸⁵. Thus, one way of gaining insight in the personal and social context of a patient is to make use of QOL measurements⁸⁶. Moreover, QOL measures have several potential uses in clinical settings such as facilitation of communication, prioritisation of problems, screening for possible problems, identification of preferences and monitoring changes to treatment⁸⁷.

Although the consequences of symptoms and the co-occurring disorders of TS may be potentially socially disabling, there is a lack of research investigating QOL in individuals with tics and tic disorders⁸⁸. A study by Stefl investigating how QOL is influenced in adults with TS found that, of the 431 questionnaires returned, 53.1% of the sample had sought some form of counselling to help them cope with the effect of their tics on daily life⁸⁹. In addition, when the sample was compared with a normal population sample, TS individuals presented low scores on self-ratings of mental health status. Another study showed that 88% of the sample demonstrated that tics had a negative impact on their daily activities⁹⁰. There are also studies documenting that adults with TS report more problems with unemployment⁹¹, lower income⁹² and self-esteem and increased social anxiety⁹³.

Examples of recent studies investigating QOL in TS include the study by Elstner and colleagues where 103 patients with TS were interviewed and 90 of these completed measures screening for depression, anxiety and OCD; QOL was also measured using the Medical Outcomes Study (SF-36) and the Quality of Life Assessment Schedule (QOLAS)⁹⁴. They found that the sample of patients with TS had a worse QOL than the general population. In addition comorbid disorders had an effect in impairing QOL, where a high rate of patients suffered from depression, anxiety and OCD. Therefore it was concluded that QOL in patients with TS was impaired. A more recent study investigated a sample of 57 people with TS aimed at assessing the impact of TS on participants' QOL⁹⁵. It was found that TS had a

negative impact on QOL, with the areas of emotional well-being and school greatly affected.

Another study that also examined the association between tic severity, ADHD, OCD and QOL in children with TS by Bernard and colleagues⁹⁶ found that QOL was more related to co-occurring disorders than to tic severity, with ADHD and OCD being strong predictors of QOL. These studies have used generic instruments to assess QOL in TS; however, these instruments do not capture essential features of patients with TS, such as specific characteristics related to tics and repetitive behaviour⁹⁷. In this context, Cavanna and colleagues⁹⁸ developed a scale assessing the QOL of patients with TS which takes into account patient and clinician views. The Gilles de la Tourette syndrome-Quality of Life Scale (GTS-QOL) is composed of four subscales – psychological domain, physical and activities of daily living domain, obsessive-compulsive domain and cognitive domain – which encompass all aspects that have been demonstrated to have an effect on QOL in TS⁹⁹.

Considering the importance of QOL measurements in evaluation of treatments, the current study aimed to investigate QOL in TS addressing the following goal. As the rates of comorbid disorders are high in TS, this study examined the extent to which tic severity, OCD, ADHD, depression and anxiety related to QOL in a sample of adults with TS.

METHODS

Participants

Adults with TS who are members of Tourettes Action - UK and Tourette Scotland (charities that offer support and information for people with TS and their families) were invited to participate in the study. Inclusion criteria were a diagnosis of TS and being aged above 18. Thus, the sample population consisted of adults with TS who were members of the above charities and that agreed to take part in the study. In total 50 adults with TS completed the questionnaires, but four participants did not complete the sociodemographic questionnaire and were therefore excluded from the

analysis. Of the 46 remaining participants 30 were males and 16 were females. Adults ranged in age from 20 to 75 years; with a mean age of 42.06 years (SD = 15.01).

Study Design and Procedures

This study consisted of a survey design using data collected through self-report questionnaires from TS adult members of Tourettes Action - UK and Tourette Scotland. Members of Tourettes Action - UK received a letter (see Appendix I) attached to their March issue newsletter inviting adults with TS to participate in the study. A letter of consent (see Appendix II) also accompanied the newsletter together with a stamped self-addressed envelope. The newsletter presented a short article in the 'Research' section explaining about the current study (see Appendix III). The adult members of Tourettes Action who agreed to take part in the study completed the consent form letter and returned it to the Tourettes Action office and to ensure confidentiality of respondents, the research officer mailed the survey pack to them. Completed questionnaires did not include any identifying information and were returned to the research officer of Tourettes Action, who later provided the researcher of this study with all completed questionnaires. The researcher of this study contacted Tourette Scotland and mailed survey packs to the head office, which later returned five completed packs.

Ethical Issues

The University of Westminster Psychology Department Ethics Committee (see Appendix IV) and Tourettes Action (see Appendix V) approved this study. It is important to emphasise that participants were fully informed about the questions they would be asked prior to giving their consent. They were also provided with the researcher's e-mail address in case of any questions or concerns, and informed about receiving the results of the study via Tourettes Action's website and newsletter.

Instruments

The assessment consisted of four self-rating questionnaires and a sociodemographic questionnaire, which was completed by participants (for the survey pack sent to participants see Appendix VI).

*The Motor tic, Obsessions and compulsions, Vocal tic Evaluation Survey (MOVES)*¹⁰⁰ is a self-report scale consisting of 20 statements providing scores on five sub-scales: motor-tics, vocal-tics, obsessions, compulsions and associated symptoms. Each sub-scale is composed of four 0-3 items with a score range of 0-12. Their sums produce a total score ranging from 0-60, with a score of 60 demonstrating the worst condition. The MOVES presents sufficient reliability and adequate validity, showing good sensitivity (87%), specificity (94%) and split half reliability coefficient of 0.87¹⁰¹. In the current study, the Cronbach alpha coefficient was computed at .90, showing satisfactory reliability (see Appendix VII).

*The Hospital Anxiety and Depression (HAD) scale*¹⁰² measures anxiety and depression and contains seven items from each domain. It is a reliable instrument for screening for anxiety and depression, and has also been shown to be a valid measure. It presented satisfactory reliability and good validity in a large sample of 51,930 participants in Norway, showing both sub-scales to demonstrate values of Cronbach's coefficient (α) of 0.80 and 0.76 respectively¹⁰³. Each item is scored on a four point (0-3) response category, thus possible scores range from 0 to 21 for anxiety and 0 to 21 for depression (0-7 = normal; 8-10 = borderline abnormal; 11-21 = abnormal). In the present study, the Cronbach alpha coefficient was .87 (see Appendix VIII).

Adult ADHD Self-Report Scale (ASRS v1.1) Screener, this questionnaire is composed of 6 questions and it was developed by Kessler and colleagues¹⁰⁴ in conjunction with the World Health Organisation (WHO). The items are scored by assigning one point to each of the checkmarks that appear in the shaded area of the questionnaire. Four or more checkmarks show that participants' symptoms may indicate Adult ADHD. A study of the validation of the ASRS of 668 subscribers of a health plan showed that the internal consistency reliability was in the range 0.63-0.72

and test-retest reliability (Pearsons correlations) in the range 0.58-0.77¹⁰⁵. In the current study, the Cronbach alpha coefficient was .83 (see Appendix IX).

*The Gilles de la Tourette Syndrome-Quality of Life Scale (GTS-QOL)*¹⁰⁶ consists of four sub-scales: psychological, physical and activities of daily living, obsessive-compulsive and cognitive, forming a 27-item questionnaire. Scores for these sub-scales are produced from the sum of items and transformed to a range of 0 to 100. The total score from the sum of the sub-scales is transformed to a range of 0 to 100. The GTS-QOL presents high internal consistency reliability and test-retest reliability (Cronbach alpha exceeds 0.8). In the present study, the Cronbach alpha coefficient was .93 (see Appendix X).

Statistical Analysis

Data were analysed using SPSS for Windows version 16.0. Standard Multiple Regression was performed to examine the extent to which tic severity, OCD, ADHD, anxiety and depression related to QOL in adults with TS.

RESULTS

Of the initial 46 participants who completed the questionnaires 30 were males (65.2%) and 16 were females (34.8%). The mean age was 42.06 years (SD = 15.01), ranging from 20 to 75 years. The reported mean age of onset of tics was 10.57 (SD = 8.08), mean age at the time of diagnosis was 29.58 (SD = 15.41). Just half of the respondents (50%) were currently taking medication. (The sociodemographic characteristics of participants for whom questionnaires were completed are presented in Table 1.

Table 1. *Sociodemographic characteristics of participants (N = 46)*

Characteristics		
Mean age, (SD)		42.06 (15.01)
Mean age at tic onset, (SD)		10.57 (8.08)
Mean age at diagnosis of TS, (SD)		29.58 (15.41)
Medication, %		50.0
No medication, %		47.8
Sex, %	Male	65.2
	Female	34.8
Marital status, %	Single	47.8
	Partner/married	43.5
	Divorced/separated	8.7
Accommodation, %	With parents	21.7
	Council or privately rented	32.6
	Own flat/house	43.5
	Residential	2.2
Education, %	Left school before 16, no exam	17.4
	GCSE, A-level	30.4
	Teaching, vocational training	13.0
	University graduate, degree	37.0
	Special schooling	2.2
Employment, %	Employed	52.2
	Unemployed	28.3
	Other (at school, retired, housewife)	19.6

The clinical characteristics: tic severity, obsession-compulsion, anxiety, depression, ADHD and the QOL in TS are presented in Table 2.

Table 2. *Clinical characteristics of participants (N = 46)*

Characteristics	
Mean MOVES tic severity score, (SD)	11.52 (4.71)
Mean MOVES obsession-compulsion score (SD)	7.5 (4.85)
Mean HAD anxiety score (SD)	10.80 (4.35)
Mean HAD depression score (SD)	5.15 (3.68)
Mean ADHD score (SD)	3.52 (2.23)
Mean GTS-QOL standardised score (SD)	38.64 (20.21)
Mean GTS-QOL VAS score (SD)	54.78 (25.71)

Note: MOVES = Motor tic, Obsessions and compulsions, Vocal tic Evaluation Survey; HAD = Hospital Anxiety and Depression Scale; ADHD = Adult ADHD Self-Report Scale (ASRS v1.1) Screener; GTS-QOL = The Gilles de la Tourette Syndrome-Quality of Life Scale (GTS-QOL); VAS = Visual Analogue Scale.

The reliability of the scales used in this study was assessed via the use of Cronbach's coefficient alpha. For the 'tic severity subscale', which was calculated by adding motor and vocal tic items from the MOVES scale, the Cronbach's alpha was computed at .813, indicating acceptable reliability (see Appendix XI). The 'obsession-compulsion subscale' was formed by adding obsessive and compulsive items from the MOVES scale, the Cronbach's alpha was .828 (see Appendix XII), also indicating satisfactory reliability. The 'anxiety subscale' and 'depression subscale' were both determined from the HAD scale and the Cronbach's alpha computed were .846 and .728 respectively (see Appendices XIII and XIV). The ADHD scale, as mentioned before, displayed a Cronbach's alpha of .835 and the GTS-QOL scale presented a Cronbach's alpha of .937 (see Appendices IX and X).

The raw data (for description of the data file see Appendix XV) was entered into SPSS. The dependent variable in this study was the standardised overall scores on the GTS-QOL scale. This variable and all the independent variables (tic severity, OCD, anxiety, depression and ADHD) were screened for the assumptions of parametric tests. The depression subscale and the ADHD scale violated the assumption of normality (see Appendix XVI, p. 8), but all the other scales met the assumptions. As a consequence, the validity and usefulness of these variables as a predictor in the regression analysis was prone to be limited. Based on the modest sample size of this study these violations were expected.

In the analysis to determine whether tic severity, OCD, anxiety, depression and ADHD related to QOL in TS participants, the evaluation of the assumptions was performed through preliminary screening of residuals, which offered an assessment of normality, linearity and homoscedasticity of residuals simultaneously (see Appendix XVII, p. 3-7). The tic severity on the MOVES correlated strongly with the GTS-QOL scale, $r = .67$, $P < .0005$. The obsession-compulsion MOVES subscale also presented a strong correlation with GTS-QOL scale, $r = .64$, $P < .0005$. This was also the case

for anxiety and depression scores on the HAD scale, $r = .73$, $P < .0005$ and $r = .66$, $P < .0005$ respectively. The scores on the ADHD scale were also significantly correlated, $r = .59$, $P < .0005$ (for the correlation table see Appendix XVII, p. 1).

The research question of this study addressed the relationship between the above variables and QOL in TS; the summary of the Standard Multiple Regression analysis is shown in Table 3.

Table 3. *Standard Multiple Regression for tic severity, OCD, anxiety, depression and ADHD predicting scores on GTS-QOL.*

Variable	B	SE B	β
MOVES tic severity score	1.51	.48	.26*
MOVES obsession-compulsion score	.86	.55	.20
HAD anxiety score	1.03	.57	.22
HAD depression score	1.97	.60	.36**
ADHD score	.56	1.07	.06

* $P = .022$; ** $P = .002$.

As a result of the analysis a significant model emerged: $F(5, 40) = 25.12$, $P < .0005$. The model explained 72.8% of the variance (Adjusted $R^2 = .728$). When comparing the contribution of each independent variable using Beta values, the variable ‘total depression scores’ made the strongest unique contribution to explaining the dependent variable: ‘standardised total scores’ of GTS-QOL ($\beta = .36$, $P = .002$). The next variable, which made a slightly smaller contribution, was tic severity ($\beta = .26$, $P = .02$), followed by ‘anxiety’ ($\beta = .22$, $P = 0.79$), ‘obsession-compulsion’ ($\beta = .20$, $P = .12$) and ‘ADHD’ ($\beta = .06$, $P = .59$). Of note, tic severity and depression variables were significant predictors of QOL in TS, but the other three variables were not.

DISCUSSION

This study sought to examine the relative contribution of clinical characteristics of TS: tic severity, OCD, anxiety, depression and ADHD on the quality of life of adults with TS, amongst members of Tourettes Action - UK and Tourette Scotland charities. This section discusses the results of this study in addition to recommendations to future research directions in this area. In the sample of the current study the QOL of adults with TS related more to depression and tic severity; anxiety, OCD and ADHD were not strong predictors of QOL. Generally, results indicated that depression followed by tic severity strongly predicted QOL in the TS sample, but anxiety, OCD and ADHD did not. These results show, in turn, that the presence of depression and tic severity has an impact on the lives of adults with TS. These findings are similar to those of previous literature (Eltner and colleagues¹⁰⁷) that investigated the QOL of 103 patients with TS. Their results showed that comorbid disorders such as depression, anxiety and OCD occurred in a high proportion of the patients and that depression was related to impaired QOL.

In contrast to previous research which showed that motor and phonic tic severity does not predict QOL in TS population (e.g. Bernard and colleagues¹⁰⁸) but that co-morbidities such as ADHD and OCD are strong predictors, the present study has shown that tic severity is a strong predictor of QOL, while ADHD and OCD are not. Another study mentioned previously (Cutler and colleagues¹⁰⁹) that examined the QOL of a sample of 57 young people with TS, found that greater symptom severity with reference to tics, ADHD and obsessive compulsive symptoms related to lower QOL. The findings of the current study provide confirmation for the fact that there is a relationship between tic severity and QOL, as shown by the study of Cutler and colleagues; however this was not the case for the ADHD and OCD variables.

This study found that within the co-occurring psychopathologies analysed, depression was the strongest predictor of QOL in the sample. As noted before, it has been shown through uncontrolled investigations that depression and depressive symptoms are common in TS¹¹⁰. For example, a study by Robertson and colleagues¹¹¹ investigating 90 adults with TS using several rating scales found that their scores were substantially higher when compared with normal population data. The first study to

examine QOL in TS taking into account comorbid disorders, by Elstner and colleagues¹¹², concentrated on three disorders: depression, anxiety and obsessive-compulsive behaviours. When examining the influence of these three conditions on QOL they found out that 21% of their sample scored high in the Beck Depression Inventory, showing the presence of depression. Moreover, the patients with depression presented worse QOL in contrast with patients without depression as they scored significantly lower on all subscales of the SF-36, apart from physical functioning. The data of the current study are, therefore, consistent with these findings.

The findings of this study fit with previous research in relation to the relationship between tics and quality of life. The early investigation of Stefl¹¹³ of the impact of QOL on adults with TS showed that more than half of their sample looked to mental health services in order to help them to cope with the effects of their tics on daily life. A further study, by Ernberg and colleagues¹¹⁴ also demonstrated that 88% of their participants reported their tics had a negative impact on their everyday activities. It is important to emphasise that in these two studies a high number of participants also reported other non-TS problems, such as learning difficulties and psychological disorders¹¹⁵.

An aspect of the current study that is important to consider is that all of these studies, which investigated the QOL in TS population, have used generic instruments but these measures do not succeed in capturing the main characteristics of people with TS, for example specific properties associated to tics and repetitive behaviours¹¹⁶. Therefore no instruments have been used so far that specifically measure QOL in adults with TS. This is the first study to use a health-related quality of life measure for adults with TS. The GTS-QOL scale, which has been recently developed, considers important aspects of TS such as motor and vocal tics, and takes into account the person's own views regarding important aspects related to their health status¹¹⁷.

The present study has some limitations that should be noted. Firstly, the sample size was relatively small, thus some caution must be taken into account when generalising from the findings. In addition, as participants were recruited solely from members of Tourettes Action – UK and Tourette Scotland, the support that is

provided by these charities might have influenced their responses and these data might not be entirely representative of the population of adults with TS. Furthermore, specific demographic differences and recruitment methods need to be considered when interpreting the results. It is important to note that bias in membership may be an issue, as not all adults with a diagnosis of TS join Tourettes Action - UK and Tourette Scotland. Secondly, the use of self-report scales for data collection may restrict the interpretation of the results. For example, when completing the questionnaires participants may aim their responses at making themselves socially acceptable; moreover honesty is an issue that needs to be considered when gathering data through self-report measures. Finally, the questionnaires used in the study measured tic severity, OCD, depression, anxiety and ADHD only, and this may not fully inform all the symptoms related with TS which might have an impact on QOL.

The results of the current study suggest some directions for future research. As mentioned previously, the prevalence of comorbid disorders in TS is high and may have a negative impact on the QOL of adults with TS. Therefore it is crucial that further research is developed in order to identify the factors that contribute to an impaired QOL within a wider and multicultural TS population. In this way, more effective treatment programmes may assist practitioners, thus benefiting patients. Further studies should investigate the impact of QOL on family members of people with TS, as families can offer support towards helping them to cope with their daily difficulties.

The findings of this study indicate that depression and tic severity have a strong impact on the QOL of adults with TS and that 72.8% of the variance on the QOL-GTS scores can be explained by scores on tic severity, OCD, anxiety, depression and ADHD scales. This, in turn, suggests that these factors have an impact on QOL and that they should be addressed in interventions. One such important aspect for intervention would be to further explore the impact of depression and depressive symptoms and tic severity on the everyday life of adults with TS. This could be achieved using additional scales and in-depth interviews.

In conclusion, this study emphasises the impact of tic severity and comorbid disorders on the QOL of adults with TS using the GTS-QOL scale, which considers

the complexity of the clinical characteristics of this population. The findings may inform professionals in this area of the importance of addressing these issues when providing treatments and interventions.

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REFERENCES

-
- ¹ Leckman J, Peterson B. (1993) cited in Spencer T, Biederman J, Harding M, et al. Disentangling the overlap between Tourette's disorder and ADHD. *J Child Psychol Psychiatry* 1998; 39: 1037-1044.
- ² Pauls DL (1992) cited in Spencer T, Biederman J, Harding M, et al. Disentangling the overlap between Tourette's disorder and ADHD. *J Child Psychol Psychiatry* 1998; 39: 1037-1044.
- ³ Stern JS, Burza S, Robertson MM. Gilles de la Tourette's syndrome and its impact in the UK. *Postgrad Med J* 2005; 81: 12-19.
- ⁴ Singer HS. Current issues in Tourette syndrome. *Movement Disorders*, 2000; 15 (6): 1051-1063.
- ⁵ Singer HS. Current issues in Tourette syndrome. *Movement Disorder* 2000 15; (6): 1051-1063.
- ⁶ Robertson MM, Cavanna AE. Tourette Syndrome. Oxford, UK: Oxford University Press; 2008.
- ⁷ Staley D, Wand R, Shady G. Tourette disorder: a cross-cultural review. *Comprehensive Psychiatry* 1997; 8 (1): 6-16.
- ⁸ American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed, text revision) (DSM-IV-TR). Washington, DC: APA; 2000.
- ⁹ American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed, text revision) (DSM-IV-TR). Washington, DC: APA; 2000.
- ¹⁰ American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed, text revision) (DSM-IV-TR). Washington, DC: APA; 2000.
- ¹¹ Robertson MM. The prevalence and epidemiology of Gilles de la Tourette syndrome part 1: the epidemiological and prevalence studies. *Journal of Psychosomatic Research* 2008; 65: 461-472.
- ¹² Goldenberg JN, Brown SB, Weiner WJ (1994) cited in Robertson MM. The prevalence and epidemiology of Gilles de la Tourette syndrome part 1: the epidemiological and prevalence studies. *Journal of Psychosomatic Research*, 2008; 65: 461-472.
- ¹³ Leckman JF. Tourette's syndrome. *Lancet* 2002; 360: 1577-86.
- ¹⁴ Leckman JF. Tourette's syndrome: when habit-forming systems form habits of their own? *Neuron* 2000; 28: 349-354.

-
- ¹⁵ Leckman JF, Zhang H, Vitale A, Lahnin F, Lynch K, Bondi C, (1998) cited in Leckman JF. Tourette's syndrome: when habit-forming systems form habits of their own? *Neuron* 2000; 28: 349-354.
- ¹⁶ Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123:425-462.
- ¹⁷ Newman S. Study of several involuntary functions of the apparatus of movement, gripping, and voice by Jean-Marc Gaspard Itard (1825). *History of Psychiatry* 2006; 17 (3): 333-351.
- ¹⁸ Gilles de la Tourette, G. Study of a nervous affliction characterized by motor incoordination with echolalia and coprolalia. *History of Psychiatry* 1998; 9: 102-120.
- ¹⁹ Kushner HI. *A cursing brain? The Histories of Tourette Syndrome*. London: England, Harvard University Press.
- ²⁰ Newman S. Study of several involuntary functions of the apparatus of movement, gripping, and voice by Jean-Marc Gaspard Itard (1825). *History of Psychiatry* 2006; 17 (3): 333-351.
- ²¹ Stern JS, Burza S, Robertson MM. Gilles de la Tourette's syndrome and its impact in the UK. *Postgrad Med J* 2005; 81: 12-19.
- ²² Stern JS, Burza S, Robertson MM. Gilles de la Tourette's syndrome and its impact in the UK. *Postgrad Med J* 2005; 81: 12-19.
- ²³ Robertson MM. The prevalence and epidemiology of Gilles de la Tourette syndrome. Part 1: the epidemiological and prevalence studies. *J Psychosomatic Research* 2008; 65: 461-472.
- ²⁴ Gaze C, Kepley HO, Walkup JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.
- ²⁵ Gaze C, Kepley HO, Walkup JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.
- ²⁶ Staley D, Wand R, Shady G. Tourette disorder: a cross-cultural review. *Comprehensive Psychiatry* 1997; 8 (1): 6-16.
- ²⁷ Shenken LI (1980) cited in Staley D, Wand R, Shady G. Tourette disorder: a cross-cultural review. *Comprehensive Psychiatry* 1997; 8 (1): 6-16.
- ²⁸ Abuzzahab FS, Anderson FO (1976) cited in Staley, D, Wand, R, Shady, G. Tourette disorder: a cross-cultural review. *Comprehensive Psychiatry* 1997; 8 (1): 6-16.
- ²⁹ Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.

-
- ³⁰ Singer HS. Tourette's syndrome: from behaviour to biology. *Lancet Neurol* 2005; 4: 149-59.
- ³¹ Kurlan R, Whitmore, D, Irvine, C, McDermott MP, Como PG. (1994) cited in Robertson MM. The prevalence and epidemiology of Gilles de la Tourette syndrome. Part 1: the epidemiological and prevalence studies. *J Psychosomatic Research* 2008; 65: 461-472.
- ³² Manson A, Banerjee S, Eapen V, Zeitlin H, Robertson MM (1998) cited in Robertson MM. The prevalence and epidemiology of Gilles de la Tourette syndrome. Part 1: the epidemiological and prevalence studies. *J Psychosomatic Research* 2008; 65: 461-472.
- ³³ Robertson MM. The prevalence and epidemiology of Gilles de la Tourette syndrome. Part 1: the epidemiological and prevalence studies. *J Psychosomatic Research* 2008; 65: 461-472.
- ³⁴ Robertson MM. The prevalence and epidemiology of Gilles de la Tourette syndrome. Part 1: the epidemiological and prevalence studies. *J Psychosomatic Research* 2008; 65: 461-472.
- ³⁵ Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ³⁶ Comings DE, Hines JA, Comings BG (1990) cited in Robertson, MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ³⁷ De Lange N, Olivier M. Mother's experiences of aggression in their Tourette's children. *International Journal for the Advanced Counselling* 2004; 26 (1): 65-77.
- ³⁸ Robertson MM. The prevalence and epidemiology of Gilles de la Tourette syndrome. Part 1: the epidemiological and prevalence studies. *J Psychosomatic Research* 2008; 65: 461-472.
- ³⁹ Kushner HI. *A cursing brain? The Histories of Tourette Syndrome*. London: England, Harvard University Press.
- ⁴⁰ Kushner HI. *A cursing brain? The Histories of Tourette Syndrome*. London: England, Harvard University Press.
- ⁴¹ Kushner HI. *A cursing brain? The Histories of Tourette Syndrome*. London: England, Harvard University Press.
- ⁴² Evans AE (1993) cited in Kushner HI. *A cursing brain? The Histories of Tourette Syndrome*. London: England, Harvard University Press.
- ⁴³ Kurlan R, Como PG, Miller B et al. The behavioural spectrum of tic disorders: a community based study. *Neurology* 2002; 59: 414-420.

-
- ⁴⁴ Kompoliti K, Goetz CG (1998) cited in Singer HS. Current issues in Tourette syndrome. *Movement Disorder* 2000; 15 (6): 1051-1063.
- ⁴⁵ Mennesson M, Klink BA, Fortin, AH (1993) cited in Singer HS. Current issues in Tourette syndrome. *Movement Disorder* 2000; 15 (6): 1051-1063.
- ⁴⁶ Singer HS. Current issues in Tourette syndrome. *Movement Disorder* 2000; 15 (6): 1051-1063.
- ⁴⁷ Walkup JT, Hopkins J cited in Olson LL, Singer HS, Goodman WK, Maria BL. Tourette syndrome: diagnosis, strategies, therapies, pathogenesis, and future research directions. *J Child Neurol* 2006; 21: 630-641.
- ⁴⁸ Walkup JT, Hopkins J cited in Olson LL, Singer HS, Goodman WK, Maria BL. Tourette syndrome: diagnosis, strategies, therapies, pathogenesis, and future research directions. *J Child Neurol* 2006; 21: 630-641.
- ⁴⁹ Walkup JT, Hopkins J cited in Olson LL, Singer HS, Goodman WK, Maria BL. Tourette syndrome: diagnosis, strategies, therapies, pathogenesis, and future research directions. *J Child Neurol* 2006; 21: 630-641.
- ⁵⁰ Staley D, Wand R, Shady G. Tourette disorder: a cross-cultural review. *Comprehensive Psychiatry* 1997; 8 (1): 6-16.
- ⁵¹ Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ⁵² Robertson MM. Mood disorders and Gilles de la Tourette's syndrome: an update on prevalence, etiology, comorbidity, and clinical associations, and implications. *Journal of Psychosomatic Research* 2006; 61:349-358.
- ⁵³ Freeman RD, Fast DK, Burd L, Kerbeshian J, Robertson MM, Sandor P. An international perspective on Tourette syndrome: selected findings from 3500 individuals in 22 countries. *Developmental Medicine & Child Neurology* 2000; 42: 436-447.
- ⁵⁴ Gaze C, Kepley HO, Walkup, JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.
- ⁵⁵ American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed, text revision) (DSM-IV-TR). Washington, DC: APA; 2000.
- ⁵⁶ Kadesjo B, Gillberg C (2000) cited in Gaze C, Kepley HO, Walkup, JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.
- ⁵⁷ Scahill L, Sukhodolsky DG, Williams SK, Leckman JF (2005) cited in Gaze C, Kepley HO, Walkup, JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.

-
- ⁵⁸ Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ⁵⁹ Apter A, Pauls DL, Bleich A et al (1993) cited in Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ⁶⁰ Gaze C, Kepley HO, Walkup JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.
- ⁶¹ Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ⁶² Gaze C, Kepley HO, Walkup JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.
- ⁶³ Robertson MM, Yakeley JW (1993) cited in Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ⁶⁴ Robertson (1995) cited in Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ⁶⁵ Goodman WK, Storch EA, Geffken GR, Murphy TK. Obsessive-compulsive disorder in Tourette syndrome. *J Child Neurol* 2006; 21: 704-714.
- ⁶⁶ Gaze C, Kepley HO, Walkup JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.
- ⁶⁷ King RA, Leckman JF, Scahill L, Cohen DJ (1999) cited in Kurlan R, Como PG, Miller B, Palumbo D et al. The behavioural spectrum of tic disorders: a community-based study. *Neurology* 2002; 59: 414-420.
- ⁶⁸ Singer HS. Tourette syndrome: from behaviour to biology. *Lancet Neurol* 2005; 4: 149-159.
- ⁶⁹ Stern JS, Burza S, Robertson MM. Gilles de la Tourette's syndrome and its impact in the UK. *Postgrad Med J* 2005; 81: 12-19.
- ⁷⁰ Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ⁷¹ Robertson MM. Mood disorders and Gilles de la Tourette's syndrome: an update on prevalence, etiology, comorbidity, clinical associations, and implications. *Journal of Psychosomatic Research* 2006; 61: 349-358.
- ⁷² Robertson MM, Trimble MR, Lees AJ (1988) cited in Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.

-
- ⁷³ Robertson MM. Mood disorders and Gilles de la Tourette's syndrome: an update on prevalence, etiology, comorbidity, clinical associations, and implications. *Journal of Psychosomatic Research* 2006; 61: 349-358.
- ⁷⁴ Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ⁷⁵ Coffey B, Frazier J, Chen S (1992) cited in Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ⁷⁶ Comings DE, Comings BG. A controlled study of Tourette syndrome: I. attention-deficit disorder, learning disorders and school problems. *Am. J. Hum. Genet.* 1987; 41: 701-741.
- ⁷⁷ Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ⁷⁸ Gaze C, Kepley HO, Walkup JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.
- ⁷⁹ Leckman JF, Zhang H, Vitale A et al. (1998) cited in Gaze C, Kepley HO, Walkup JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.
- ⁸⁰ Gaze C, Kepley HO, Walkup JT. Co-occurring psychiatric disorders in children and adolescents with Tourette syndrome. *J Child Neurol* 2006; 21: 657-664.
- ⁸¹ Comings DE, Comings BG. A controlled study of Tourette syndrome: I. attention-deficit disorder, learning disorders and school problems. *Am. J. Hum. Genet.* 1987; 41: 701-741.
- ⁸² Abwender DA, Como PG, Kurlan, R et al. (1996) cited in Stern JS, Burza S, Robertson MM. Gilles de la Tourette's syndrome and its impact in the UK. *Postgrad Med J* 2005; 81: 12-19.
- ⁸³ Stern JS, Burza S, Robertson MM. Gilles de la Tourette's syndrome and its impact in the UK. *Postgrad Med J* 2005; 81: 12-19.
- ⁸⁴ Muldoon MF, Barger SD, Flory JD, Manuck SB. What are quality of life measurements measuring? *British Medical Journal* 1998; 316: 542-545.
- ⁸⁵ Muldoon MF, Barger SD, Flory JD, Manuck SB. What are quality of life measurements measuring? *British Medical Journal* 1998; 316: 542-545.
- ⁸⁶ Bowling A (1995) cited in Higginson I, Carr AJ. Measuring quality of life: using quality of life measures in the clinical setting. *BMJ* 2001; 322:1297-1300.
- ⁸⁷ Higginson I, Carr AJ. Measuring quality of life: using quality of life measures in the clinical setting. *BMJ* 2001; 322:1297-1300.

⁸⁸ Storch EA, Merlo LJ, Lack C, Milsom VA, Geffken GR, Goodman WK, Murphy TK. Quality of life in youth with Tourette's syndrome and chronic tic disorder. *Journal of Clinical Child and Adolescent Psychology* 2007; 36: 217-227.

⁸⁹ Stefl ME. Mental health needs associated with Tourette syndrome. *American Journal of Public Health* 1984; 74: 1310-1313.

⁹⁰ Ernberg G, Cruse RP, Rothner DA (1987) cited in Storch EA, Merlo LJ, Lack C, Milsom VA, Geffken GR, Goodman WK, Murphy TK. Quality of life in youth with Tourette's syndrome and chronic tic disorder. *Journal of Clinical Child and Adolescent Psychology* 2007; 36: 217-227.

⁹¹ Robertson MM, Trimble MR, Lees AJ cited in Storch EA, Merlo LJ, Lack C, Milsom VA, Geffken GR, Goodman WK, Murphy TK. Quality of life in youth with Tourette's syndrome and chronic tic disorder. *Journal of Clinical Child and Adolescent Psychology* 2007; 36: 217-227.

⁹² Bruun RD (1988) cited in Storch EA, Merlo LJ, Lack C, Milsom VA, Geffken GR, Goodman WK, Murphy TK. Quality of life in youth with Tourette's syndrome and chronic tic disorder. *Journal of Clinical Child and Adolescent Psychology* 2007; 36: 217-227.

⁹³ Thibert AL, Day HI, Sandor P (1995) cited in Storch EA, Merlo LJ, Lack C, Milsom VA, Geffken GR, Goodman WK, Murphy TK. Quality of life in youth with Tourette's syndrome and chronic tic disorder. *Journal of Clinical Child and Adolescent Psychology* 2007; 36: 217-227.

⁹⁴ Elstner K, Selai CE, Trimble MR, Robertson MM. Quality of Life (QOL) of patients with Gilles de la Tourette's syndrome. *Acta Psychiatr Scand* 2001; 103: 52-59.

⁹⁵ Cutler D, Murphy T, Gilmour J, Heyman I. The quality of life of young people with Tourette syndrome. *Child: Care, Health and Development* 2009; 35:496-504.

⁹⁶ Bernard BA, Stebbins GT, Siegel S, Schultz T et al. Determinants of quality of life in children with Gilles de la Tourette syndrome. *Movement Disorders* 2009; 24: 1070-1073.

⁹⁷ Cavanna AE, Schrag A, Morley D, Orth M, Robertson MM et al. The Gilles de la Tourette syndrome-quality of life scale (GTS-QOL) development and validation. *Neurology* 2008; 71: 1410-1416.

⁹⁸ Cavanna AE, Schrag A, Morley D, Orth M, Robertson MM et al. The Gilles de la Tourette syndrome-quality of life scale (GTS-QOL) development and validation. *Neurology* 2008; 71: 1410-1416.

⁹⁹ Cavanna AE, Schrag A, Morley D, Orth M, Robertson MM et al. The Gilles de la Tourette syndrome-quality of life scale (GTS-QOL) development and validation. *Neurology* 2008; 71: 1410-1416.

-
- ¹⁰⁰ Gaffney GR, Sieg K, Hellings J. The MOVES: a self-rating scale for Tourette's syndrome. *Journal of Child and Adolescent Psychopharmacology* 1994; 4:269-280.
- ¹⁰¹ Gaffney GR, Sieg K, Hellings J. The MOVES: a self-rating scale for Tourette's syndrome. *Journal of Child and Adolescent Psychopharmacology* 1994; 4:269-280.
- ¹⁰² Zigmund AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983; 67: 361-370.
- ¹⁰³ Mykletun A, Stordal E, Dahl AA. Hospital anxiety and depression (HAD) scale: factor structure, item analyses and internal consistency in a large population. *British Journal of Psychiatry* 2001; 179: 540-544.
- ¹⁰⁴ Kessler RC, Adler L, Ames M, Delmer O, Faraone S, Hiripi E. The World Health Organization Adult ADHD Self-Report Scale (ASRS): A Short Screening Scale for Use in the General Population. *Psychological Medicine* (in press).
- ¹⁰⁵ Kessler RC, Adler LA, Gruber MJ, Sarawate CA, Spencer T, Van Brunt DL. Validity of the World Health Organization adult ADHD self-report scale (ASRS) screener in a representative sample of health plan members. *Int. J. of Methods Psychiatr. Res.* 2007; 16: 52-65.
- ¹⁰⁶ Cavanna AE, Schrag A, Morley D, Orth M, Robertson MM et al. The Gilles de la Tourette syndrome-quality of life scale (GTS-QOL) development and validation. *Neurology* 2008; 71: 1410-1416.
- ¹⁰⁷ Elstner K, Selai CE, Trimble MR, Robertson MM. Quality of Life (QOL) of patients with Gilles de la Tourette's syndrome. *Acta Psychiatr Scand* 2001; 103: 52-59.
- ¹⁰⁸ Bernard BA, Stebbins GT, Siegel S, Schultz T et al. Determinants of quality of life in children with Gilles de la Tourette syndrome. *Movement Disorders* 2009; 24: 1070-1073.
- ¹⁰⁹ Cutler D, Murphy T, Gilmour J, Heyman I. The quality of life of young people with Tourette syndrome. *Child: Care, Health and Development* 2009; 35:496-504.
- ¹¹⁰ Robertson MM. Mood disorders and Gilles de la Tourette's syndrome: an update on prevalence, etiology, comorbidity, clinical associations, and implications. *Journal of Psychosomatic Research* 2006; 61: 349-358.
- ¹¹¹ Robertson MM, Trimble MR, Lees AJ (1988) cited in Robertson MM. Tourette syndrome, associated conditions and the complexities of treatment. *Brain* 2000; 123: 425-462.
- ¹¹² Elstner K, Selai CE, Trimble MR, Robertson MM. Quality of Life (QOL) of patients with Gilles de la Tourette's syndrome. *Acta Psychiatr Scand* 2001; 103: 52-59.

¹¹³ Stefl ME. Mental health needs associated with Tourette syndrome. *American Journal of Public Health* 1984; 74: 1310-1313.

¹¹⁴ Ernberg G, Cruse RP, Rothner DA (1987) cited in Storch EA, Merlo LJ, Lack C, Milsom VA, Geffken GR, Goodman WK, Murphy TK. Quality of life in youth with

¹¹⁵ Storch EA, Merlo LJ, Lack C, Milsom VA, Geffken GR, Goodman WK, Murphy TK. Quality of life in youth with Tourette's syndrome and chronic tic disorder. *Journal of Clinical Child and Adolescent Psychology* 2007; 36: 217-227.

¹¹⁶ Cavanna AE, Schrag A, Morley D, Orth M, Robertson MM et al. The Gilles de la Tourette syndrome-quality of life scale (GTS-QOL) development and validation. *Neurology* 2008; 71: 1410-1416.

¹¹⁷ Cavanna AE, Schrag A, Morley D, Orth M, Robertson MM et al. The Gilles de la Tourette syndrome-quality of life scale (GTS-QOL) development and validation. *Neurology* 2008; 71: 1410-1416.