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# The impact of tics, obsessive–compulsive symptoms, and impulsivity on global functioning in Tourette syndrome

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ABSTRACT

This study investigated the relationships between tics, obsessive–compulsive symptoms (OCS), and impulsivity, and their effects on global functioning in Japanese patients with Tourette syndrome (TS), using the dimensional approach for OCS. Fifty-three TS patients were assessed using the Yale Global Tic Severity Scale, the Dimensional Yale–Brown Obsessive–Compulsive Scale, the Impulsivity Rating Scale, and the Global Assessment of Functioning Scale. Although tic severity scores were significantly and positively correlated with OCS severity scores, impulsivity severity scores were not significantly correlated with either. The global functioning score was significantly and negatively correlated with tic and OCS severity scores. Of the 6 dimensional OCS scores, only aggression scores had a significant negative correlation with global functioning scores. A stepwise multiple regression analysis showed that only OCS severity scores were significantly associated with global functioning scores. Despite a moderate correlation between tic severity and OCS severity, the impact of OCS on global functioning was greater than that of tics. Of the OCS dimensions, only aggression had a significant impact on global functioning. Our findings suggest that it is important to examine OCS using a dimensional approach when analyzing global functioning in TS patients.



## 1. Introduction

Tourette syndrome (TS) is a neurodevelopmental disorder characterized by multiple motor tics and one or more vocal tics that persist for at least 1 year (American Psychiatric Association, 2013). The comorbidities of TS often include various psychiatric disorders such as obsessive–compulsive disorder (OCD) and attention-deficit/hyperactivity disorder (ADHD). The prevalence of OCD among TS patients is estimated to be as high as 30%, and as much as 50% or more if sub-clinical cases are included (Hounie et al., 2006). Several studies have suggested that the severity of tics and the prevalence of self-injurious behavior (SIB) and impulsivity are higher among TS patients with OCD than those without OCD (Cardona et al., 2004; Kano et al., 2010b).

Impulsivity is a multifaceted construct, and is a core symptom of ADHD, which is frequently comorbid with TS as well as OCD (Freeman, 2007). Patients with TS can exhibit impulse-control problems such as rage attacks. Rage attacks are defined as discrete episodes of failure to resist aggressive impulses that result in serious assaultive acts or the destruction of property, wherein the degree of aggressiveness expressed is grossly out of proportion to any precipitating psychosocial stressors. Previous North American studies have indicated that the rage attacks in TS patients are associated with the presence of comorbidities including ADHD and OCD (Freeman, 2007; Budman et al., 2000). However, this association was not found in a study of Japanese TS patients (Kano et al., 2008) and remains to be confirmed. In addition, impulse control disorders characterized by significant difficulties in controlling urges to perform rewarding behavior were frequently found to be comorbid in adults with TS, and the most common one was intermittent explosive disorder whose main symptoms are rage attacks (Frank et al., 2011).

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Global functioning is impaired to a much greater degree in TS patients with comorbidities than in those without, and comorbid ADHD and OCD in particular have been associated with poorer global or psychosocial functioning (Gorman et al., 2010; Lebowitz et al., 2012; Pringsheim et al., 2009). Several studies have suggested that OCS may have a slightly greater effect than ADHD on the symptomatology of TS, including tics (Cardona et al., 2004; Kano et al., 2010b). All of these studies have focused on the overall impact of ADHD rather than impulsivity, including impulse control problems such as rage attacks. Therefore, it remains to be clarified how tics, OCS, and impulsivity collectively interfere with the global functioning of TS patients.

When considering the impact of OCS on global functioning among TS patients, recent research findings indicate that a dimensional approach for examining OCS should be considered. Factor analytic studies using the Yale–Brown Obsessive–Compulsive Scale (Y-BOCS) have suggested that OCS among patients with OCD can be divided into 3–5 dimensions, and genetic, neuroimaging, and treatment studies have supported the usefulness of this approach (Stewart et al., 2007; Bloch et al., 2008). In addition, a relationship has been found between comorbid tic disorders and the symmetry/ordering (Labad et al., 2008) and aggressive/checking (Nikolajsen et al., 2011) dimensions of OCS among OCD patients. Furthermore, research on OCS dimension phenotypes among TS families has indicated that both the aggression/checking and symmetry/ordering dimensions were correlated within families (Leckman et al., 2003).

We investigated the relationships between tics, OCS, and impulsivity, and their effects on global functioning among Japanese TS patients. We formulated hypotheses focused on compulsivity and impulsivity, as they are important components of Obsessive–compulsive spectrum disorders including TS (Berlin and Hollander, 2014). Learning more about these relationships seems to be important for both understanding the pathogenesis and improving the treatment. We expected to find that OCS and impulsivity each affect global functioning independently, and also when combined with tics, and that the impact of OCS on global functioning is the same or greater than that of impulsivity. We also expected to find that the aggression and symmetry dimensions of OCS would have a greater effect on global functioning than other dimensions.

## 2. Methods

### 2.1. Subjects

Subjects were recruited from a specialty clinic that treats people with TS and related disorders at the Department of Child Psychiatry of the University of Tokyo Hospital during the period from February 2005 to February 2010. Subjects were included if they had a Diagnostic and Statistical Manual, Fourth Edition, Text Revision (DSM-IV-TR) diagnosis of Tourette's disorder (American Psychiatric Association, 2000). They were excluded if they had mental retardation, autistic disorder, or any neurological disorder that could interfere with the quality of the interviews. Diagnoses were made according to DSM-IV-TR criteria by expert child psychiatrists, with a high diagnostic concordance rate.

This study was approved by the Institutional Review Board of the University of Tokyo Hospital. The subjects signed informed consent forms after the study was explained to them in detail and they were assured that the decision to participate in the study would not affect their treatment in any way. If the subjects were 19 years old or younger, written informed consent was obtained from parents.

All interviews were conducted by psychologists who had in-depth knowledge of the instruments, clinical experience with TS, and no involvement with the treatment of the subjects, after training to ensure conformity of assessment.

### 2.2. Instruments

#### 2.2.1. Assessment of tics

The presence and severity of tics were evaluated for the current study using the Japanese version of the Yale Global Tic Severity Scale (YGTSS) (Leckman et al., 1989). This version has previously been proven valid and reliable (Inoko et al., 2006). On this scale, motor and vocal tics are evaluated separately (0–25) on five ordinal scales, and a total tics score is obtained by summing the individual scores (0–50). The current impairment due to tics was also assessed (0–50). The global severity score was determined (0–100) as the sum of the total tics score and the impairment score.

Additionally, tics were assessed on the basis of clinical observations and a review of the patients' medical records. Clinicians carefully investigated both the current and historical presence of tics and related symptoms such as coprolalia, which refers to the utterance of social unacceptable words, and SIB, which is the deliberate, repetitive infliction of self-harm.

#### 2.2.2. Assessment of OCS

Current OCS were evaluated using the Dimensional Y-BOCS (DY-BOCS), a rating scale developed for assessing the presence and severity of specific OCS dimensions (Rosario-Campos et al., 2006). According to the DY-BOCS, OCS were divided into six dimensions: (1) obsessions about harm due to injury, violence, aggression, or natural disasters, and related compulsions (aggression); (2) sexual and religious obsessions and related compulsions (sexual/religious); (3) obsessions and compulsions related to symmetry, ordering, counting, and arranging (symmetry); (4) contamination obsessions and cleaning compulsions (contamination); (5) obsessions and compulsions related to hoarding and collecting (hoarding); and (6) miscellaneous obsessions and compulsions (miscellaneous). The severity of each dimension was measured on three ordinal scales with six anchor points that focus on symptom frequency (0–5), the amount of distress caused (0–5), and the degree to which they interfered with functioning (0–5) during the week before examination. Global OCS severity was estimated via the same three ordinal scales. The overall level of current impairment due to OCS (0–15) was assessed for all patients. The total global score (0–30) was obtained by combining the sum (0–15) of the global severity scores for the frequency, distress, and interference, with the impairment scores (0–15). The Japanese version was designed using a rigorous methodology involving translation and back translation, and its validity and reliability were re-examined in a preliminary study (Kano et al., 2006).

#### 2.2.3. Assessment of impulsivity

Current impulsivity was evaluated using the Japanese version of the Impulsivity Rating Scale (IRS) (Lecrubier et al., 1995). The IRS is a semi-structured interview-based scale of seven items with four anchor points (0–3). The sum of the seven scores represents the global score (0–21). The Japanese version was designed using a rigorous methodology involving translation and back translation, and the validity and reliability of the original version were established.

#### 2.2.4. Assessment of global functioning

Current global functioning was evaluated using the Global Assessment of Functioning (GAF) scale (American Psychiatric Association, 2000).

#### 2.2.5. Medication and comorbidities

Information on medication was collected from the patients' psychiatrists and the medical records. Comorbid OCD and ADHD were diagnosed on the basis of DSM-IV-TR criteria, as in the case of TS.

### 2.3. Data analysis

Statistical analyses were performed using SPSS software version 18.0. To examine the interrelationships between the clinical indicators of tics, OCS, impulsivity, and global functioning, Pearson's correlation coefficients were calculated. A 0.05 level of significance was selected. To examine the effects of tics, OCS, and impulsivity on global functioning, stepwise multiple regression analyses were performed with the GAF score as the dependent variable. If the $p$-Value was less than 0.05, the corresponding independent variable was entered into the model, and if it exceeded 0.10, the corresponding independent variable was removed from the model. When an additional analysis, based on stratification by age, was performed, a $t$-test was used to compare the two groups with 0.05 as the significance level.

## 3. Results

Of the 68 patients invited to participate in this study, 58 agreed. Finally, 53 TS patients (40 men and 13 women) were included (age range, 5–43 years; mean = 17.6; standard deviation (S.D.) = 9.2). No significant difference in demographic findings was found between the 58 subjects who agreed to participate and the 10 who did not.