Phenomenological differences appearing with repetitive behaviours in obsessive–compulsive disorder and Gilles de la Tourette's syndrome

EURIPEDES C. MIGUEL, LEE BAER, BARBARA J. COFFEY, SCOTT L. RAUCH, CARY R. SAVAGE, RICHARD L. O'SULLIVAN, KATHARINE PHILLIPS, CARA MORETTI, JAMES F. LECKMAN and MICHAEL A. JENIKE

Background Obsessive–compulsive disorder (OCD) is heterogeneous, with some forms related to Gilles de la Tourette's syndrome (GTS). This is a phenomenological study designed to investigate the nature of these possible OCD subtypes and the relationship between OCD and GTS.

Method We evaluated 20 adult out-patients with OCD, 21 with GTS, and 20 with OCD plus GTS using a semi-structured interview designed to assess cognitive, sensory and autonomic phenomena preceding repetitive behaviours.

Results More cognitions and autonomic anxiety and fewer sensory phenomena were reported in OCD than in GTS. Like the GTS group, the OCD plus GTS group reported more sensory phenomena and fewer cognitions than the OCD group.

Conclusions The presence or absence of cognitions, sensory phenomena, and autonomic anxiety distinguishes repetitive behaviours in patients with OCD from those with OCD plus GTS, and GTS. These subjective experiences may be useful in subtyping OCD and may represent valid predictors of prognosis and treatment response.

Recent studies have suggested that obsessive–compulsive disorder (OCD) is heterogeneous with some forms related to tics or Gilles de la Tourette's syndrome (GTS) (Pauls & Leckman, 1986; Pauls *et al*, 1995). Such OCD patients often benefit from combined therapy with selective serotonin reuptake inhibitors plus neuroleptics, while those without GTS or tics do not improve when neuroleptics are added (McDougle *et al*, 1994). Such variability in outcome has led to phenomenological studies searching for homogeneous OCD subtypes that may predict treatment response. Most phenomenological research has attempted to identify subtypes of OCD based on the content of obsessions and compulsions as characterised by the Yale–Brown Obsessive–Compulsive Scale (Y–BOCS) Symptom Checklists studying OCD patients with and without comorbid GTS. Some studies (George *et al*, 1993; Leckman *et al*, 1995), but not others (Leonard *et al*, 1992; Holzer *et al*, 1994) found aggressive, sexual, and symmetry obsessions to be more frequent in OCD patients with comorbid tics. Compulsions similar to complex motor tics (i.e. touching, tapping, rubbing, blinking or staring) are more frequent in OCD patients with comorbid tics (Pitman *et al*, 1987; Robertson *et al*, 1988; George *et al*, 1993; Holzer *et al*, 1994; Leckman *et al*, 1995), whereas cleaning compulsions are more frequent in OCD patients without comorbid tics (Holzer *et al*, 1994; Leckman *et al*, 1995). Baer (1994) factor-analysed symptoms of the Y–BOCS Symptom Checklists in OCD and identified a symmetry/hoarding factor related to OCD with comorbid tics or GTS. Further empirical support for this association was reported by Leckman *et al*, 1995. Despite some agreement among these studies, a consistent means for subtyping has not yet emerged.

Recently, we proposed subtyping patients with OCD and/or GTS based on the subjective experiences they report as preceding their repetitive behaviours (Miguel *et al*, 1995). Our preliminary data suggested that uncomfortable urges or sensations (sensory phenomena) usually precede simple tics, complex tics, and compulsions in patients with GTS (Leckman *et al*, 1993, 1994; Miguel *et al*, 1995). On the other hand, thoughts, ideas, or images (cognitive phenomena) and symptoms of autonomic anxiety (e.g. dry mouth, sweating, palpitations, difficulty breathing, choking, nausea or abdominal distress) usually precede compulsions in patients with OCD (George *et al*, 1993; Miguel *et al*, 1995). Given the practical difficulty and lack of operational criteria for distinguishing many complex motor tics (characteristic of GTS) from compulsions (characteristic of OCD) and evidence suggesting a common pathophysiology for these two disorders, we suggested an objective term, "repetitive behaviours performed in a stereotyped manner (intentional or not intentional)" (taken from the DSM–III–R description of compulsions) to characterise the various stereotyped repetitive behaviours (e.g., simple tics, complex motor tics, and compulsions) reported in patients with either OCD or GTS (Miguel *et al*, 1995). The present study was undertaken to extend the results of our previous study (Miguel *et al*, 1995) by including a comparison group of patients with comorbid OCD and comorbid GTS. Our research hypotheses were: in the OCD group, intentional repetitive behaviours are typically preceded by cognitive phenomena and autonomic anxiety, but not by sensory phenomena; in the GTS group, intentional repetitive behaviours are typically preceded by sensory phenomena, but not by cognitive phenomena or autonomic anxiety; and in the OCD plus comorbid GTS group, intentional repetitive behaviours are typically more frequently accompanied by sensory phenomena, and less frequently by autonomic anxiety than the OCD group.

METHOD

Twenty patients with OCD without tics or GTS (OCD group), 21 GTS patients without OCD (GTS group), and 20 patients with OCD plus GTS (OCD plus GTS group) were evaluated. All were adult (>17 years old) out-patients. Subjects were excluded if they had a history of a systemic illness or significant neurological disorder. No patients were psychotic. All patients gave written informed consent to participate.

Patients were recruited from the Massachusetts General Hospital OCD Clinic and

https://doi.org/10.1192/bjp.170.2.140 Published online by Cambridge University Press

Research Unit (MGH OCD Clinic), the McLean Tourette's Clinic, and the Boston (MA) chapter of the Tourette Syndrome Association.

Evaluation procedures

Patients were administered the Structured Clinical Interview for DSM–III–R (SCID; Spitzer *et al*, 1988), including additional modules designed by the authors (available upon request) for the diagnosis of GTS, chronic motor tics, body dysmorphic disorder, trichotillomania and attention-deficit hyperactivity disorder. All subjects met DSM–III–R (American Psychiatric Association, 1987) criteria for OCD, GTS, or both. All diagnoses were confirmed by two psychiatrists (E. C. M. and B. J. C. or R. L. O. or M. A. J.). Subjects were also administered the Y–BOCS (Goodman *et al*, 1989*a*,*b*) and the Yale Global Tic Severity Scale (YGTSS; Leckman *et al*, 1989), the Beck Depression Inventory (BDI; Beck *et al*, 1961) and the Beck Anxiety Inventory (BAI; Beck *et al*, 1988).

Symptom Checklists from the Y–BOCS and from the YGTSS were administered to identify tics, obsessions, compulsions, and other stereotyped repetitive behaviours. These behaviours were subsequently the focus of a semi-structured interview (USP–HARVARD Repetitive Behaviours Interview; Miguel *et al*, 1995) assessing cognitive, sensory, and autonomic phenomena related to repetitive behaviours on a severity scale of 0 (none) to 4 (extreme). Y–BOCS Symptom Checklist categories were analysed following the procedure described by Holzer *et al* (1994).

All patients were rated by a psychiatrist with expertise in GTS and/or OCD (E. C. M., B. J. C., R. L. O.). One-third of the sample (20 patients) were also rated simultaneously by two psychiatrists. Reliability between raters was excellent for the SCID (mean kappa coefficient for all SCID diagnoses between E. C. M. and B. J. C.=0.94; mean kappa coefficient for all SCID diagnoses between E. C. M. and R. L. O.=0.98) and the USP-HARVARD Repetitive Behaviours Interview (mean Spearman coefficient of all scores between E. C. M. and B. J. C.=0.98; mean Spearman coefficient of all scores between E. C. M. and R. L. O.=0.99).

For more details on the evaluation procedure and the phenomenological interview (USP–HARVARD Repetitive Behaviours interview), as well as on the concepts of cognitive phenomena, sensory phenomena, and autonomic anxiety studies, see Miguel *et al* (1995). Briefly, all repetitive behaviours performed during the past week were rated. These included behaviours performed intentionally (i.e. when the patient determines mentally the need to perform the repetitive behaviour), and those performed unintentionally (such as simple and involuntary motor and vocal tics). Patients also identified the most severe repetitive behaviour, based on distress, frequency, and interference with social or occupational functioning. Cognitive phenomena (i.e. thoughts, ideas or images) were measured with 'yes/no' questions. All patients who reported thoughts, ideas or images preceding their behaviour, also reported a fear or worry associated with them. Therefore, we measured the severity of the cognitive phenomena based on the intensity of associated fears. Sensory phenomena were defined as "generalised or focal uncomfortable feelings or sensations preceding tics that usually are relieved by a movement" (Leckman *et al*, 1993; Tourette Syndrome Classification Study Group, 1993). Autonomic anxiety was rated as present when at least three of the following symptoms were reported to precede intentional repetitive behaviours or were present when the behaviour was prevented: dry mouth, sweating, flushes or chills, dizziness, raising of hair, palpitations or accelerated heart rate, difficulty breathing, trembling or shaking, choking, nausea or abdominal distress, numbness or tingling sensations, trouble swallowing or a 'lump in throat'. The severity of the autonomic anxiety was also measured according to a four-point scale (Miguel *et al*, 1995).

Statistical analysis

Statistical comparisons were carried out via analyses of variance (ANOVA), independent *t*-tests, contingency table analysis by χ^2 (or Fisher's exact test of probability for 2×2 tables). Kappa coefficients for agreement among raters and Spearman correlation coefficients were used to assess interrater reliability. A two-tailed alpha level of 0.05 was adopted. When ANOVA found overall significant differences between the two groups, post-hoc pairwise Tukey tests were performed.

RESULTS

Demographic and clinical comparisons

Table 1 contains demographic information and symptom rating scales for the three groups. The three groups did not differ significantly in terms of gender, education, age, illness duration, or BDI or BAI score (Table 1).

As expected, the OCD group had a significantly older age at onset and significantly lower YGTSS scores. As expected, the GTS group had significantly lower Y–BOCS scores. The OCD plus GTS group did not differ from the OCD group on the Y–BOCS score, nor from the GTS group on the YGTSS score (Table 1).

Significantly more patients in the GTS and the OCD plus GTS groups were currently on psychotropic medication. This difference could not, however, be accounted for by differential use of neuroleptics. The three groups reported equal past use of psychotropic medications (Table 1).

Subjective experiences associated with repetitive behaviours

Intentional repetitive behaviours were reported by all patients in the OCD and the OCD plus GTS groups, and in 16 (76%) patients in the GTS group (five patients reported only unintentional or occasionally intentional repetitive behaviours (i.e. experienced as always or usually involuntary)). Twelve patients in the GTS group had intentional repetitive behaviours listed as compulsions on the Symptom Checklist from the Y–BOCS. However, their behaviours were not sufficiently severe or time-consuming to meet DSM–III–R criteria for OCD.

Figure 1 shows the severity of subjective experiences associated with the intentional repetitive behaviour reported as most severe in each group. These behaviours were: cleaning/washing (9 (45%) OCD patients, 3 (15%) OCD plus GTS patients, 2 (12.5%) GTS patients); checking (7 (35%) OCD patients, 3 (15%) OCD plus GTS patients, 2 (12.5%) GTS patients); repeating rituals (1 (5%) OCD patient); counting (2 (24%) GTS patients); ordering/arranging (1 (20%) OCD patients, 2 (10%) OCD plus GTS patients, 2 (12.5%) GTS patients) and miscellaneous compulsions such as mental rituals (2 (10%) OCD patients, 5 (75%) OCD plus GTS patients), touching (2 (25%) OCD plus GTS patients, 4 (25%) GTS patients); behaviours performed to relieve an abnormal sensation (1 (5%) OCD plus GTS patient, 2 (12.5%) GTS patients) and behaviours performed to have things even or balanced (1 (5%) OCD plus GTS patient, 2 (12.5%) GTS patients).

https://doi.org/10.1192/bjp.170.2.140 Published online by Cambridge University Press

Table 1 Demographics and rating scale scores

Variables	OCD (*n*=20)			OCD plus GTS (*n*=20)			GTS (*n*=21)			Analyses		
	n (%)	Mean	s.d.	*n* (%)	Mean	s.d.	*n* (%)	Mean	s.d.	*F* (d.f.=2,58)	χ^2 (d.f.=2)	*P*
Demographic data												
Male gender	12 (60)			12 (60)			13 (62)				0.021	0.99
Female	8 (40)			8 (40)			8 (38)					
Education (years)		15.9	2.6		14.8	2.5		14.9	3.2	0.90		0.41
Age (years)		36.0	10.30		29.7	8.8		30.1	11.5	2.33		0.11
Age at onset (years)		11.4[ab]	6.8		7.0[b]	2.5		7.4[a]	2.2	6.23		0.004
Illness duration (years)		24.6	11.3		22.1	7.9		22.7	11.0	0.34		0.71
Past psychotropic use	14 (70)			16 (80)			16 (76)				0.55	0.76
Current psychotropic use	7 (35)[ab]			16 (80)[b]			17 (81)[a]				12.32	0.002
Current neuroleptics	0			3 (15)			4 (19)				4.02	0.13
Scales												
YGTSS		0[ab]	0		47.2[b]	16.5		48.4[a]	19.5	69.80		<0.001
Y-BOCS		20.0[a]	6.1		22.0[b]	5.7		4.1[ab]	5.0	63.12		<0.001
BDI		11.7	7.7		16.1	13.3		8.3	8.2	3.04		0.06
BAI		11.3	7.5		10.8	9.9		6.9	7.9	1.87		0.16

[a or b]: values that significantly differ ($P<0.05$) share same superscript.

Cognitive phenomena

The GTS group reported significantly fewer cognitive phenomena preceding their repetitive behaviours when either the most severe behaviour (Fig. 1) or any repetitive behaviour was considered (i.e. at least one repetitive behaviour, including all intentional and unintentional behaviours studied) ($\chi^2=24.5$, d.f.=2, $P<0.0001$). The OCD and the OCD plus GTS groups did not differ on this variable (Fig. 1). However, when all behaviours are considered in the analysis, more patients in the OCD plus GTS group reported at least one intentional repetitive behaviour that was never preceded by cognitions (4/20 (20%) OCD patients, 14/20 (70%) OCD plus GTS patients, P=0.004).

Sensory phenomena

The OCD group reported significantly fewer sensory phenomena preceding their repetitive behaviours when either the most severe behaviour (Fig. 1) or any repetitive behaviour ($\chi^2=26.7$, d.f.=2, $P<0.0001$) was considered. Comparisons between the OCD and the OCD plus GTS groups revealed the same tendency (Fig. 1), with the OCD group reporting significantly less sensory phenomena.

Simultaneous cognitive and sensory phenomena

The OCD plus GTS group reported significantly more repetitive behaviours preceded by both cognitive and sensory phenomena (simultaneously or alternatively) associated with the same intentional repetitive behaviour (4/20 (20%) OCD patients, 15/20 (75%) OCD plus GTS patients, 5/21 (24%) GTS patients, $\chi^2=15.9$, d.f.=2, P=0.0001).

Autonomic anxiety

The GTS group reported significantly less autonomic anxiety preceding (or when prevented from performing) their repetitive behaviours when either the most severe behaviour (Fig. 1) or any repetitive behaviour ($\chi^2=18.9$, d.f.=2, $P<0.0001$) was considered. Comparisons between the OCD and the OCD plus GTS groups did not reveal statistically significant differences in terms of the severity of the reported autonomic anxiety associated with the most severe repetitive behaviour (Fig. 1). However, the frequency (presence or absence) of autonomic anxiety associated with the most severe repetitive behaviour was higher in the OCD group than in the OCD plus GTS group (14 (70%) OCD patients; 6 (30%) OCD plus GTS patients; P=0.02). The same tendency was found for the frequency of autonomic anxiety associated with any repetitive behaviour (P=0.06).

Analysis of all repetitive behaviours

Although the numbers are small for statistical procedures, when the analyses were extended to include all repetitive behaviours studied grouped according to the Y-BOCS categories (mean number of behaviours (s.d.): OCD group: 8.8 (4.5); OCD plus GTS: 11.1 (6.8); GTS group: 2.2 (2.5); F=18.2 d.f.=2, 6, $P<0.001$), the pattern of subjective experiences described above was similar for repetitive behaviours such as checking, cleaning, touching and mental rituals. This pattern can be illustrated by taking checking behaviours as an example. Checking behaviour (including repeating rituals such as re-reading and re-writing) was the most frequent intentional repetitive behaviour reported across the three groups (16/20 (80%) OCD patients, 13/20 (65%)

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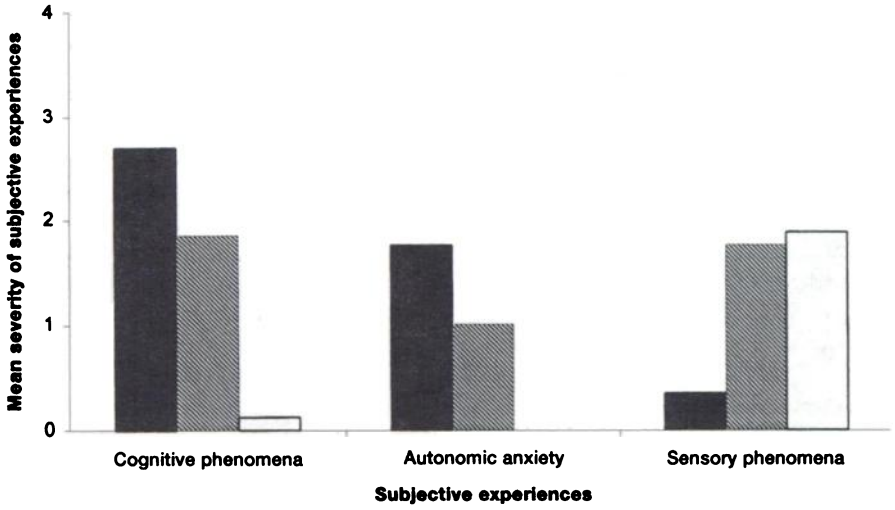

Fig. 1 Mean severity of subjective experiences associated with the most severe intentional repetitive behaviour (ANOVA for cognitive, sensory, and autonomic phenomena, $P<0.0001$). Comparisons between the OCD, and the OCD plus GTS groups on: cognitive $t=1.867$, (d.f.=38) $P=0.07$; sensory $t=-3.67$, (d.f.=38) $P=0.001$; and autonomic phenomena $t=1.68$ (d.f.=38) $P=0.10$. ■, OCD Group ($n=20$); ▨, OCD plus GTS Group ($n=20$); □, GTS Group ($n=16$).

OCD plus GTS patients, 8/21 (38%) GTS patients). Among the three groups, checking behaviours were less frequently preceded by sensory phenomena in the OCD group (F=[d.f.=2,37]=9.35, P=0.001) and less frequently by cognitions (F=5.97, d.f.=2, 37, P=0.006) and autonomic anxiety in the GTS group (F=3.480, d.f.=2,37, P=0.04).

Counting and hoarding were exceptions to this rule. Counting was generally not preceded by cognitions (only 1/7 (14%) patients in the OCD group, and 2/6 (33%) patients in the OCD plus GTS group reported cognitions preceding their counting behaviour), nor by autonomic anxiety (no patients in any group). Hoarding, usually not preceded by any thought or anxiety in all groups, was associated with cognitions (e.g. fears that the object might be needed if thrown away) and autonomic anxiety only when the behaviour was prevented.

Differences on the Y-BOCS Symptom Checklists

As expected, the GTS group less frequently reported several Y-BOCS categories of obsessions and compulsions. For the purpose of this paper we focused the Y-BOCS analyses on the comparisons between the OCD and the OCD plus GTS groups. The Y-BOCS subcategories of: violent or horrific images (P=0.03); concern with illness or diseases (P=0.001); concern with body part or appearance ($P<0.001$); need to know or remember (P=0.005); fear of saying certain things (P=0.01); intrusive images (non-violent) (P=0.001); intrusive sounds ($P<0.001$); touching (P=0.02); trichotillomania (P=0.05); eyeblinking and other simple tics (P=0.001) were significantly more frequent in the OCD plus GTS group. No differences between the two groups were found for the remaining Y-BOCS subcategories.

Correlations among subjective experiences and other variables

Cognitive phenomena occurred less frequently among individuals with a family history of GTS ($\chi^2=14.1$, d.f.=1, $P=<0.0001$) and correlated positively with Y-BOCS scores (r=0.6, $P<0.01$) and negatively with YGTSS scores ($r=-0.04$, $P<0.01$). Sensory phenomena occurred more frequently among individuals with a family history of GTS (χ^2=5.8, d.f.=1, P=0.02), and correlated positively with YGTSS scores (r=0.6, $P<0.001$) and negatively with age at illness onset ($r=-0.4$, P=0.001). Autonomic anxiety was associated with cognitive phenomena (χ^2=11.2, d.f.=1, P=0.001) and with female gender (χ^2=5.6, d.f.=1, P=0.02) (women also had higher scores on the BAI: r=0.3, P=0.05), and correlated positively with Y-BOCS scores (r=0.5, P=0.001). Moreover, there was a negative association between autonomic anxiety and sensory phenomena (χ^2=1.9, d.f.=1, P=0.001) and autonomic anxiety and family history of GTS (χ^2=10,1, d.f.=1, P=0.001). Autonomic anxiety also correlated negatively with YGTSS scores ($F=-0.4$, P=0.01).

Patients in the OCD group with an earlier age at onset (less than 10 years of age) were more frequently male ($\chi^2=7.5$, d.f.=1, P=0.006), tended to report at least one repetitive behaviour preceded by sensory phenomena (χ^2=3.3, d.f.=1, P=0.07), and reported lower scores on the BAI (r=0.5, P=0.03).

DISCUSSION

As predicted, we found a higher frequency of cognitive phenomena and autonomic anxiety, and a lower frequency of sensory phenomena, in association with repetitive behaviours in OCD than in GTS. Generally, OCD plus GTS patients reported intermediate frequencies of autonomic anxiety and cognitive phenomena, consistent with a continuum concept.

Focusing on the two groups with OCD, as we predicted the OCD plus GTS group was characterised by a higher frequency of sensory phenomena, simultaneous or alternating sensory and cognitive phenomena preceding repetitive behaviours, more behaviours entirely without associated cognitions, and a tendency to report less frequent autonomic anxiety associated with repetitive behaviours. If confirmed these findings may represent valid and reliable phenomenological variables for subtyping OCD.

The symptomatic differences between groups cannot be attributed to differences in gender, education, age or illness duration. Moreover, the two OCD groups did not differ in terms of illness severity (as measured by Y-BOCS, BDI and BAI scores). The finding of older age at onset in the OCD group than in both GTS groups is in agreement with previous studies (Leonard *et al*, 1992; Holzer *et al*, 1994; Leckman *et al*, 1994).

Comparisons with previous research

These results replicate previous findings that repetitive behaviours in OCD that occur in association with GTS are less frequently preceded by cognitions (George *et al*, 1993). Likewise, our data concerning sensory phenomena in GTS patients are largely congruent with previous reports concerning the presence of premonitory sensory urges that frequently precede tics (Leckman *et al*, 1993; Cohen & Leckman, 1992).

https://doi.org/10.1192/bjp.170.2.140 Published online by Cambridge University Press

In contrast, our data concerning sensory phenomena in OCD patients appear to be at variance with those reported by Leckman *et al* (1994, 1995). In these earlier studies, 70 to 80 per cent of OCD patients with or without chronic tics or GTS reported having "just right" perceptions that preceded or accompanied the exacting performance of compulsive rituals. These "just-right" phenomena were reported in approximately one-third of both of our GTS groups, and only 15% of the OCD group. The differences observed may reflect differences in the study populations and/or the methods used for data collection (previous studies used self-report questionnaires; Leckman *et al*, 1994, 1995).

Our data concerning the frequency of obsessive–compulsive symptom categories endorsed on the Y-BOCS Symptom Checklists in the two groups replicate previous findings that frequencies of aggressive obsessions as well as compulsive touching and other tic-like compulsions are greater in OCD plus GTS patients (Pitman *et al*, 1987; Robertson *et al*, 1988; George *et al*, 1993; Holzer *et al*, 1994). However, our data differ from earlier studies in which patients with OCD and no history of tics report higher rates of contamination worries and cleaning compulsions while OCD patients with GTS report higher rates of sexual and religious obsessions (Pitman *et al*, 1987; George *et al*, 1993; Holzer *et al*, 1994; Leckman *et al*, 1994). The reasons for these discrepancies are unclear but may have to do with the number of subjects as well as the GTS diagnosis (we did not include patients with tics without GTS).

Interpretations of correlation analyses

Family and genetic data suggest that there are several forms of OCD, including one that is genetically related to GTS (Pauls & Leckman, 1986; Pauls *et al*, 1995). Our findings of a positive association between family history of GTS and sensory phenomena, and a negative association between family history of GTS and cognitive phenomena and autonomic anxiety, support the notion that sensory phenomena are an important feature of GTS and the tic-like form of OCD, whereas behaviours always associated with cognitions and autonomic anxiety characterise the non-tic form of OCD.

Although the numbers are small, patients in the OCD group (n=8) who reported sensory phenomena also had some tic-like features. Of these patients, seven had illness onset before age 10, six were males, and four reported at least one repetitive behaviour associated with neither cognitions nor autonomic anxiety. Previous studies have suggested that age at onset in OCD has a bimodal distribution, and that earlier onset is associated with an increased risk for tic disorders and male preponderance (Pauls & Leckman, 1986; Leonard *et al*, 1992; Pauls *et al*, 1995). Therefore, these patients may represent a subgroup who have a form of OCD that is closer to the GTS end of the spectrum, despite a negative personal history of tics. Our finding that patients with earlier age at onset more frequently reported sensory phenomena is confounded, however, by the fact that the GTS patients had earlier age at onset.

The intercorrelations among symptom types indicate that autonomic anxiety and cognitions are closely linked in some way. In fact, all patients who reported autonomic anxiety associated with any repetitive behaviour (14 in the OCD group, seven in the OCD plus GTS group, and none in the GTS group) also had cognitive phenomena preceding their behaviours. One limitation of the current study was that autonomic anxiety was assessed via patients' subjective self-reports, rather than objectively, via the measurement of autonomic indices. Moreover, correlation does not ensure causation, and a causal relationship between anxiety and obsessional cognitions of OCD has long been a topic of debate. Several studies have found obsessive thoughts to be accompanied by increased anxiety and autonomic activity (Hodgson & Rachman, 1972). Advocates of a learning theory of OCD argue that obsessions represent conditioned responses to anxiety-provoking stimuli whereas compulsions represent mechanisms that reduce anxiety (Carr, 1974). Others have proposed that the clinically observable anxiety associated with obsessions is a consequence, of OCD cognitions (Hohen-Saric *et al*, 1995). Similarly, the presence in our study of cognitions in all patients who reported autonomic anxiety suggests that the autonomic anxiety may be secondary to the cognitive phenomena.

The presence of autonomic anxiety was negatively associated with family history of GTS and positively associated with being female. These findings converge with those of other studies (Pauls *et al*, 1995) that suggest there may be a subtype of OCD with a later age at onset, and female preponderance.

The rationale for selecting the three dimensions studied reflects contemporary neurobiological models of the OCD–GTS spectrum. Current theories about the pathophysiology of these disorders propose that both OCD and GTS involve dysfunction within cortico-striatal pathways (Modell *et al*, 1989; Baxter *et al*, 1990). There exist several parallel segregated cortico-striatal pathways, each subserving different types of functions (Alexander *et al*, 1990). These include a prefrontal circuit via the caudate nucleus mediating cognitive functions, a sensorimotor circuit via the putamen mediating sensations and movements, and a limbic circuit via the ventral striatum (i.e. nucleus accumbens) mediating affect and motivation. It has been hypothesised that the phenotypic presentation along the OCD–GTS spectrum reflects the topography of dysfunction within the striatum (Baxter *et al*, 1990). Thus, heuristically, the phenomenologic dimensions used in the current study parallel the purported functionality of the different cortico-striatal pathways described.

Although this study was fundamentally hypothesis-driven, as a phenomenological survey, the design was not intended to allow for conclusions regarding underlying pathophysiology. Additional research using this strategy for characterising patients in the context of treatment trials, neuroimaging, and family/genetic studies will be necessary to determine whether this scheme can provide valid and reliable indicators of pathophysiology, prognosis or treatment response.

ACKNOWLEDGEMENTS

Supported in part by a grant from Conselho Nacional de Pesquisa e Desenvolvimento (CNPq Brazil) to Dr Miguel. The authors thank the assistance of Lynn Buttolph, MD and Nancy Keuthen, PhD, and the technical assistance of Peter Manzo and Andrea Borgman. Presented, in part, at the "148th Annual Meeting of the American Psychiatric Association", Miami, Florida, May 20–25, 1995 and at the "1st International Congress on Education and Progress in OCD", Barcelona, Spain, June 22–25, 1995.

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CLINICAL IMPLICATIONS

- OCD and GTS repetitive behaviours seem to be disturbed along a phenomenological continuum. Cognitions, sensory phenomena and autonomic anxiety may form the basis of a useful method for identifying subtypes along this continuum.
- The OCD subtype with comorbid GTS seems to differ from other OCD subtypes without tics or GTS and is characterised by a higher frequency of sensory phenomena, simultaneous or alternating sensory and cognitive phenomena preceding repetitive behaviours, and more behaviour not associated with cognitions and autonomic anxiety.
- OCD is an heterogeneous disorder; the OCD form related to GTS seems to respond differently to treatment.

LIMITATIONS

- Most patients were recruited from specialised clinics, posing a risk that the cohort studied was not representative of a more general community-based sample.
- Confounding medication effects could not be ruled out, since more patients in the GTS groups were taking medication.
- There is a risk of rater bias, since clinicians were not blind to patient diagnosis or *a priori* hypothesis.

EURIPEDES C. MIGUEL, MD, Department of Psychiatry, University of São Paulo Medical School, São Paulo, SP, Brazil, and Department of Psychiatry, Massachusetts General Hospital, Boston, MA; LEE BAER, Department of Psychiatry, Massachusetts General Hospital, Boston, MA; BARBARA J. COFFEY, MD, Department of Psychiatry, Massachusetts General Hospital, Boston, MA and McLean Hospital, Belmont, MA, Harvard Medical School, Boston, MA; SCOTT L. RAUCH, MD, CARY R. SAVAGE, PhD, RICHARD L. O'SULLIVAN, MD, Department of Psychiatry, Massachusetts General Hospital, Boston, MA; KATHARINE PHILLIPS, MD, Butler Hospital and Department of Psychiatry and Human Behaviour, Brown University School of Medicine, Providence (RI); CARA MORETTI, Department of Psychiatry, Massachusetts General Hospital, Boston, MA; JAMES F. LECKMAN, MD, Child Study Center, Yale University, New Haven, CT; MICHAEL A. JENIKE, MD, Department of Psychiatry, Massachusetts General Hospital, Boston, MA

Correspondence: Euripedes C. Miguel, Instituto de Psiquiatria do Hospital das Clínicas da Falculdade de Medicina da USP, Rua Ovídio Pires de Campos s/no. São Paulo SP, CEP: 05430–010, Brasil. e-mail: ECMIGUEL@USP.BR; Fax: 011–280–0842

(First received 19 March 1996, final revision 1 July 1996, accepted 23 July 1996)

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https://doi.org/10.1192/bjp.170.2.140 Published online by Cambridge University Press