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ORIGINAL CONTRIBUTION

Obsessive–compulsive symptoms are associated with psychiatric comorbidities, behavioral and clinical problems: a population-based study of Brazilian school children

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Abstract Pediatric-onset obsessive–compulsive disorder (OCD) is underdiagnosed, and many affected children are untreated. The present study seeks to evaluate the presence and the clinical impact of OCD and obsessive–compulsive symptoms (OCS) in a large sample of school-age children. In Phase I, we performed an initial screening using the *Family History Screen* (FHS). In Phase II, we identified an "at-risk" sample, as well as a randomly selected group of children. A total of 2,512 children (6–12 years old) were assessed using the FHS, the *Development and Well-Being Assessment* (DAWBA), the *Strengths and Difficulties Questionnaire* (SDQ), and the *Child Behavior Checklist* (CBCL). Data analyses included descriptive and multivariate analytical techniques. 2,512 children (mean age: 8.86 ± 1.84 years; 55.0 % male) were categorized into one of the three diagnostic groups: OCD (*n* = 77), OCS (*n* = 488), and unaffected controls (*n* = 1,947). There were no significant socio-demographic differences (age, gender, socioeconomic status) across groups. The OCS group resembled the OCD on overall impairment, including school problems and delinquent behaviors. However, the OCD group did have significantly higher rates of several comorbid psychiatric disorders, including separation anxiety, generalized anxiety, and major depressive disorder, than OCS or unaffected controls. Moreover, the OCD group also scored higher than the SDQ, as well as on each of CBCL items rated by the parent. Our findings suggest that there is a psychopathological continuum between OCS

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and OCD in school-aged children. The presence of OCS is associated with functional impairment, which needs further investigation in longitudinal studies.

Keywords Child and adolescent psychiatry · Comorbidities · Epidemiology · Obsessive–compulsive disorder · School-aged children

Introduction

Obsessive–compulsive disorder (OCD) is a chronic and disabling psychiatric disorder with a lifetime prevalence of 2–3 % in the general adult population [1, 2]. The onset of the first obsessive–compulsive symptoms (OCS) occurs during childhood in the majority of cases [3–5]. However, data on the prevalence of OCD among children and adolescents are scarce. Available prevalence estimates range from 0.1 % [6] to 3.6 % [7] for pediatric-onset OCD. Pediatric-onset OCD is highly underdiagnosed and 90 % of affected children are left untreated [4, 8].

In line with the obsessive–compulsive spectrum phenomena hypothesis [9], previous studies report that functional impairment [10, 11] and several psychiatric comorbidites are associated not only with OCD, but subclinical OCD and OCS as well [7, 12–14]. Moreover, longitudinal studies suggest that OCS can persist over time [11, 15] and increase the risk of developing OCD [16, 17], supporting a dimensional approach.

However, there is limited evidence on the prevalence and clinical characteristics of OCS in non-clinical populations and most of the studied samples include adolescents [7, 9, 18–21] and young adults [22], but only two focused on school-age children [11, 15]. Furthermore, the literature is not consistent regarding epidemiological and several clinical characteristics. For instance, prevalence rates of OCS in studies range from 2.0 % [12] to 19.0 % [19] in juvenile samples. Additionally, some studies report equal gender ratio distribution [7, 11, 13, 14, 19, 20] while others report higher prevalence of OCS in boys [12, 23]. Studies in children, adolescents and adults indicate that patients with OCS resemble OCD in their presentation and psychiatric comorbidities [7–9, 11–14], but data concerning behavioral problems and the level of clinical impairment for children with OCS/OCD research remain scarce.

Thus, this study aimed to investigate the obsessive–compulsive dimensional approach (OCD, OCS, and unaffected controls) in a community-based sample of 2,512 Brazilian school-age children (6–12 years old) by assessing several socio-demographic and clinical parameters, including psychiatric comorbidities, co-occurring psychiatric symptoms and functional impairment.

Methods

Procedures

This study examined data from the cross-sectional phase of a large community school-based cohort from the National Institute of Developmental Psychiatry (INPD) in Brazil http://www.inpd.org [24]. A total of 57 public schools from two large Brazilian cities (22 in Porto Alegre and 35 in São Paulo) were included and 12,500 families were approached. This study was approved by the ethics committees from the universities in these two cities. In the initial phase, written consent was obtained from all parents of participants (see Fig. 1).

Participants

Inclusion Criteria: Children aged 6–12 years old, as of school registration day, who were accompanied by their biological parent. Exclusion criteria: (a) refusal or failure to complete the interviews or consent form; (b) transfer to another school during the project, and/or (c) failure to establish contact. The final sample comprised 2,512 children (no siblings) which are divided into two groups according to an index of individual and familial screened psychopathology by the (Psychiatric) *Family History Screen* (Milne et al. [32]). As presented in Fig. 1, the community-based sample included 1,554 children judged to be "at-risk" and randomly selected group of 958 children initially judged to be not "at-risk".
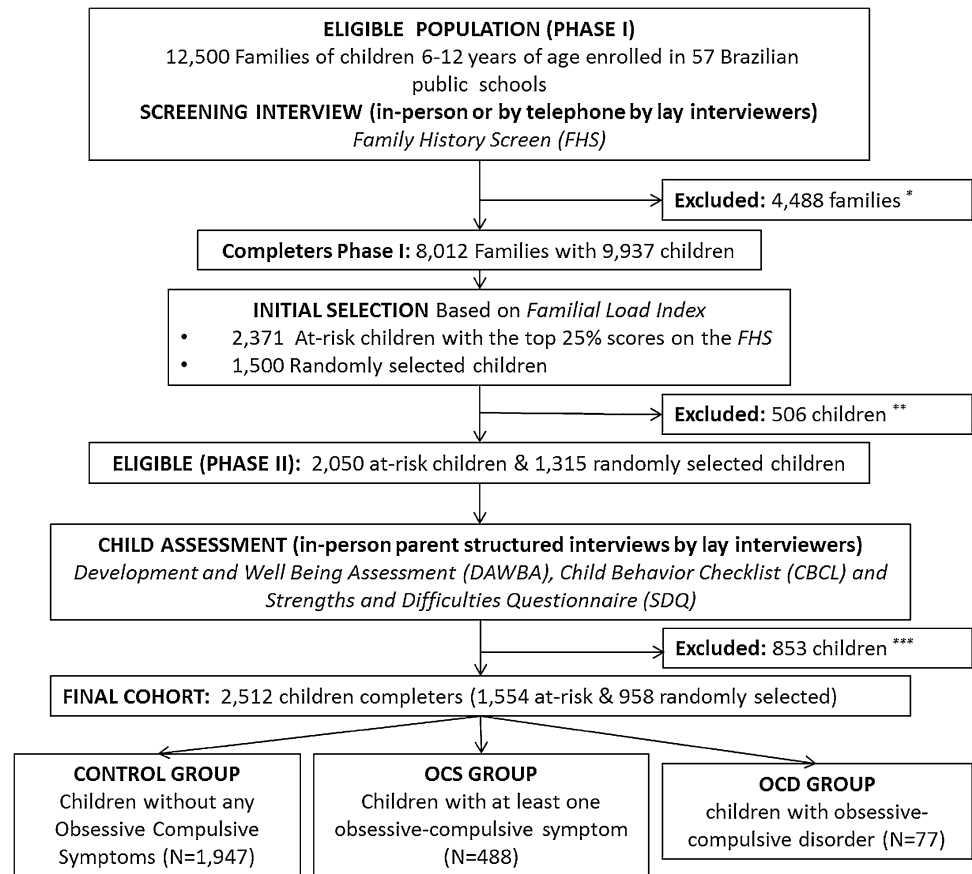
Data collection

In Phase II of the study, extensively trained lay evaluators interviewed the caregivers about the index-children (the child's biological mother was the informant in 91.5 % of the families). Training procedures for interviewers included instructional sessions comprising major psychiatric syndromes and risk factors, confidentiality, and ethical issues taught by INPD psychiatrists. Each potential interviewer was evaluated through direct observation and a written multiple-choice test. Only interviewers who showed satisfactory performance in the evaluation were recruited.

Clinical assessment and instruments

- *Sociodemographic information* age, gender and validated Brazilian socioeconomic classification that categorized families in five (A–E) socioeconomic classes according to educational level and income were obtained [25].

Fig. 1 Flowchart *asterisk*: refusal or failure to complete interview or consent form (18.8 %), registry by non-biological parent (9.2 %); provided invalid phone contacts/fail contact (5.3 %), other (2.6 %); (*double asterisk*): school transfer (12.3 %); others (0.61 %); *triple asterisk* refusal or failure to complete the interviews or consent form (16.2 %); fail contact (8.6 %), other (0.5 %)

ELIGIBLE POPULATION (PHASE I)
12,500 Families of children 6-12 years of age enrolled in 57 Brazilian public schools
SCREENING INTERVIEW (in-person or by telephone by lay interviewers)
Family History Screen (FHS)

Excluded: 4,488 families *

Completers Phase I: 8,012 Families with 9,937 children

INITIAL SELECTION Based on *Familial Load Index*
- 2,371 At-risk children with the top 25% scores on the *FHS*
- 1,500 Randomly selected children

Excluded: 506 children **

ELIGIBLE (PHASE II): 2,050 at-risk children & 1,315 randomly selected children

CHILD ASSESSMENT (in-person parent structured interviews by lay interviewers)
Development and Well Being Assessment (DAWBA), Child Behavior Checklist (CBCL) and Strengths and Difficulties Questionnaire (SDQ)

Excluded: 853 children ***

FINAL COHORT: 2,512 children completers (1,554 at-risk & 958 randomly selected)

CONTROL GROUP
Children without any Obsessive Compulsive Symptoms (N=1,947)

OCS GROUP
Children with at least one obsessive-compulsive symptom (N=488)

OCD GROUP
children with obsessive-compulsive disorder (N=77)

- *Psychiatric diagnoses* assessment was conducted with the DAWBA (development and well-being assessment) [26] based on DSM-IV [27]. DAWBA has been used in several countries and is validated in Brazil [28]. Diagnoses were double rated by senior child psychiatrists and a third senior child psychiatrist gave the final diagnosis in case of disagreement.
- *OCS and OCD diagnoses* a subject was considered as part of the OCS group if he/she had at least one obsession or compulsion symptom listed in the DAWBA *Section F* (overall obsessions or compulsions and a list of symptoms including contamination and aggression obsessions; washing, checking, repetition, touching, counting and ordering-symmetry related compulsions) [26]. An OCD diagnosis was determined based on DSM-IV criteria, as follows: obsessions and/or compulsions were time consuming (more than 1 h per day) or caused clinically significant distress or impairment; and could not be attributable to the physiological effects of a substance or another medical condition [27].
- *Behavioral problems* assessment was conducted using the child behavior checklist (CBCL) [29]. The CBCL is a dimensional instrument that has been used across the world and was validated in Brazil [30]. It includes total score and sub-scales of anxiety/depression, somatic complaints, social competence problems, rule-breaking, aggressive, internalizing and externalizing behaviors [29, 30].
- *Clinical impairment* data on clinical impairment were based on the strengths and difficulties questionnaire (SDQ) [31] that includes 25 items on psychological attributes and an impact supplement assessing chronicity, distress, social impairment, and burden. School problems (failure, refusal or expulsion), delinquent behavior (theft, vandalism), overall functional impairment and referral for mental health services (psychological or psychiatric, inpatient or outpatient) were obtained using the family history screen [32].

Statistical analysis

Our main objective was to compare three groups (OCD, OCS, and unaffected controls) according to several discrete (e.g.: presence of comorbidities or impact factors) and continuous (e.g.: age, dimensional CBCL and SDQ scores) parameters. As the disproportionate number of subjects among groups would greatly affect the variance, the use of conventional modeling procedures was not advisable. Bayesian 95 % credible intervals and nonparametric Tukey 95 % confidence intervals were used [33, 34]. These

methods minimize bias due to high variance, enable comparison between groups (statistical similarities or statistical differences), and have been used successfully in previous studies [5]. Finally, to verify categorical sociodemographics variables, we conducted a two-tailed Fisher exact test [35] and Kruskal–Wallis exact test [36].

Results

Composition of OCD, OCS and control groups

This study compared demographic and clinical variables (described above) in the three diagnostic groups of interest (Fig. 1; Table 1). There were 77 (3.1 %) children assigned to the OCD group; 488 (19.4 %) assigned to the OCS group; and 1,947 (77.5 %) assigned to the Control group.

Sociodemographic status

There were no statistically significant differences on the distribution of age ($p = 0.34$), sex ($p = 0.57$), or socioeconomic ($p = 0.12$) status between groups (Table 1). The majority of the children came from middle class families (Class C).

Table 1 Sociodemographic variables among OCD, OCD and control groups

	Controls	OCS	OCD	Total
N (%)	1,947 (77.50)	488 (19.43)	77 (3.07)	2,512 (100)
Age (SD) years[(×)]	8.87 (1.85)	8.79 (1.83)	9.1 (1.82)	8.86 (1.84)
Gender (% males)[(x)]	55.9	53.3	55.8	55.0
Age and gender[(x)] distribution				
6–7 years (% males)	44.93	10.57	1.32	56.83
8–9 years (% males)	44.50	10.23	1.63	56.37
10–12 years n (% males)	41.01	10.31	2.08	53.40
Socio-economic status[(x)]				
Class A (%)	0.41	0.61	0	0.44
Class B (%)	30.3	23.98	26.0	28.9
Class C (%)	63.7	68.24	64.9	64.7
Class D (%)	5.03	6.76	9.09	5.49
Class E (%)	0.51	0.41	0	0.48

Data are presented as percentages; Socioeconomic classification categorized families in five socioeconomic classes (A to E), according to educational level and income; [(×)] Non-statistical significant differences

OCS obsessive–compulsive symptoms, *OCD* obsessive–compulsive disorder

Other psychiatric disorders

The OCD group showed significantly higher prevalence of the following psychiatric disorders: major depressive disorder, mood disorders, separation anxiety disorder, generalized anxiety disorder, attention deficit hyperactivity disorder (ADHD), compared to the OCS and the control groups. The OCD and OCS groups were similar regarding the prevalence of the following comorbidities: social phobia, anxiety disorders (grouped), oppositional defiant disorder, tic disorders and eating disorders. Both the OCD and OCS groups had a higher prevalence of these disorders compared to the unaffected control group. Post-traumatic stress disorder, specific phobia, panic and agoraphobia, and developmental disorders were less prevalent in the whole sample and there was no difference in prevalence among the OCD group, OCS group and unaffected control groups (Table 2).

Behavioral problems and clinical impairment

There was a statistically significant difference between the three groups on CBCL ratings (Table 3). The OCS group showed intermediate scores between OCD (higher behavioral impairment) and unaffected control groups (lower behavioral impairment) on the CBCL scale and its subscales of anxiety/depression, somatic complaints, social problems, rule-breaking, aggressive, internalizing and externalizing behaviors and obsessive–compulsive scale, as well as the SDQ scores. There were no significant differences between OCD and OCS groups in overall functioning impairment, school problems, delinquent behavior, and searching for previous treatment (Table 4).

Discussion

The present study reports from a large epidemiologic sample of school-age children ($n = 2,512$) in Brazil that were assessed with a comprehensive clinical protocol, including DSM-IV [27] based diagnoses and validated dimensional assessment of patterns of behavior and clinical impact [29, 31, 32]. Additionally, our study report focuses on a younger age cohort and includes a higher number of subjects than most previous reports [10, 11, 15, 21]. Our results demonstrate that children with OCS and OCD have similar levels of impairment. In addition, the prevalence of several comorbid conditions, such as social phobia, anxiety disorders (grouped), oppositional defiant disorder, tic disorders, and eating disorders, was significantly elevated compared to unaffected controls in both the OCD and OCS groups. However, the children with OCD were found to be at greater risk of several comorbid conditions including major depression, several anxiety disorders and ADHD.

Table 2 Psychiatric comorbidities in OCD, OCS and control groups

Comorbidities (%)	Controls $N = 1,947$	OCS $N = 488$	OCD $N = 77$
Any ("at least one comorbidity")	22.03[A]	35.04[B]	67.53[C]
Separation Anxiety	1.85[A]	5.12[B]	14.28[C]
Specific Phobia	3.34[A]	4.51[A]	2.60[A]
Social Phobia	0.62[A]	2.46[B]	2.60[B]
Panic and or Agoraphobia	0.05[A]	0.41[A]	1.3[A]
Post-Traumatic Stress Disorder	0.77[A]	1.23[A]	2.60[A]
Generalized Anxiety Disorder	0.77[A]	4.51[B]	12.99[C]
Anxiety Disorders (grouped)	6.68[A]	16.19[B]	25.97[B]
Major Depressive Disorder	1.90[A]	4.30[B]	19.48[C]
Bipolar Disorder	0.10[A]	0.41[A]	1.30[A]
Mood Disorders (grouped)	1.95[A]	4.71[B]	19.48[C]
ADHD	10.22[A]	10.04[A]	33.76[B]
Oppositional Defiant Disorder	4.78[A]	5.74[A,B]	12.99[B]
Conduct Disorder	1.44[A]	1.64[A,B]	5.19[B]
Pervarsive Developmental Disorders	0.51[A]	0.82[A]	1.30[A]
Tic Disorders	0.36[A]	1.84[B]	3.90[B]
Eating Disorders	0.31[A]	0.41[A,B]	2.60[B]

Data are presented as percentages. The letters A, B or C correspond to statistical significant differences ($p < 0.05$). When equal (E.g.: A = A; B = B) denote that the groups were statistically similar

ADHD attention deficit and hyperactivity disorder, *DAWBA* development and Well-Being assessment, *OCS* obsessive–compulsive symptoms, *OCD* obsessive–compulsive disorder

Table 3 Behavioral problems in OCD, OCD and control groups

Behavioral patterns, scores (PD)	Controls ($N = 1,947$)	OCS ($N = 488$)	OCD ($N = 77$)
CBCL total score*	26.75 (25.58)[A]	39.11 (27.94)[B]	64.81 (37.23)[C]
Anxiety/depression*	3.49 (3.7)[A]	5.68 (4.41)[B]	9.23 (5.77)[C]
Somatic complaints*	2.21 (2.82)[A]	3.43 (3.6)[B]	5.82 (5.19)[C]
Social competence problems*	2.41 (2.96)[A]	3.7 (3.35)[B]	6.09 (4.5)[C]
Rule-breaking behavior*	1.86 (2.72)[A]	2.5 (2.97)[B]	4.05 (4.45)[C]
Aggressive behavior*	5.79 (6.42)[A]	8.19 (6.88)[B]	12.06 (8.58)[C]
Internalizing behavior*	7.42 (7.73)[A]	11.74 (9.22)[B]	20.29 (12.77)[C]
Externalizing behavior*	7.65 (8.69)[A]	10.69 (9.28)[B]	16.12 (12.36)[C]
SDQ (symptoms score)	13.98 (7.76)[A]	17.78 (7.24)[B]	22.05 (7.48)[C]
SDQ (impact score)	0.8 (1.47)[A]	1.2 (1.65)[B]	2.3 (2.26)[C]

The letters A, B or C correspond to statistical significant differences ($p < 0.05$) between groups

PD pattern deviation, *SDQ* strengths and difficulties questionnaire, *OCS* obsessive–compulsive symptoms, *OCD* obsessive–compulsive disorder

* *CBCL* child behavior checklist and its dimensions

Table 4 Impairment status in OCD, OCS and Controls

Family history screen functional parameters (Milne et al. [32]	Controls	OCS	OCD
Delinquent behavior*	4.78[A]	8.20[B]	7.80[B]
School problems**	19.88[A]	22.75[A,B]	33.77[B]
Overall functional impairment	9.14[A]	14.34[B]	25.97[B]
Sought or were referred for mental health services[(×)]	4.78[A]	4.92[A,B]	11.69[B]

The letters A and B correspond to statistical significant differences ($p < 0.05$) between groups

OCD obsessive–compulsive disorder

* theft or vandalism; ** failure, refusal or expulsion; [(×)] psychological or psychiatric, inpatient or outpatient; *OCS* obsessive–compulsive symptoms

The prevalence of OCS (19.4 %) found in similar to previous reports [7, 19, 21, 23]. The prevalence of OCD was 3.1 %, which is high compared to some epidemiological reports in children and adolescents [13, 20] but is in accordance with other studies [7, 21]. This may be attributed to differences in diagnostic instruments utilized in these studies and to the inclusion of a proportion of "at risk" children in our sample (see: Salum et al. [24]).

There were no statistically significant differences between groups regarding gender distribution, which is consistent with some studies [11] but in contrast with others that reported a slightly higher prevalence of obsessive–compulsive phenomena in boys [12, 23]. These inconsistent results may be due to different sample characteristics and instruments used. We used the DAWBA criterion for defining OCS, which does not include questions about "hoarding" dimension. Collecting and hoarding symptoms are reported to be more prevalent in boys in a previous study (Alvarenga et al., *submitted*). Unexpectedly, OCD and OCS were not associated with increased age compared to controls, which contrasts with the literature [13, 19, 20, 22]. Our OCD group consisted of slightly older male children in comparison to other groups, even though this difference was not statistically significant.

The presence of OCS, even in the absence of full blown OCD, was associated with a higher prevalence of psychiatric comorbidities compared to controls. This finding has previously been reported in several studies [7, 10–12, 14, 20] and deserves clinical attention. Moreover, the profile of comorbidities in OCS resembled that of OCD subjects [37] reaching statistical similarity to the presence of social phobia, anxiety disorders (grouped), oppositional defiant disorder, tic disorders and eating disorders.

Several dimensional ratings of child psychopathology suggested intermediate severity in the OCS group compared to children with OCD and unaffected controls. The patterns in "anxiety/depression," "somatic complaints," and "internalizing behaviors" subscales of the CBCL reported in our sample are aligned with previous assessments in clinical OCD [16]. Furthermore, these behavioral patterns are commonly observed in anxiety and mood disorders which were much more prevalent in the OCD and OCS groups compared to controls. The patterns of "rule-breaking," "aggression," and "externalizing behaviors" in pediatric OCD have not been as emphasized in the literature [16, 38] although they have been more frequently reported in Tourette syndrome (an OCD spectrum disorder) and tic-related OCD [39]. In our sample, the externalizing and disruptive behaviors may be a directly consequence of the high rate of externalizing comorbidities associated with OCS and OCD groups (as ADHD and disruptive disorders), likewise previously described in the literature [38]. However, the mentioned behaviors may be associated, in part, to the very nature of OCS, which leads to behaviors like confrontation, opposition, and aggression. These combative and deregulated behaviors are often associated with increased family accommodation to symptoms which is associated with OCD poor prognosis [40].

The OCS group showed intermediate scores between OCD (greater impairment) and control groups (lower impairment) concerning reduced social skills, reduced positive behaviors, and increased maladaptive behaviors by SDQ. It is possible that children with OCS already manifest neuropsychological deficits in the social and emotional spheres that have been consistently described in OCD [41].

Regarding functionality, OCD and OCS groups showed a continuous phenotype. It is worth mentioning that previous studies report academic problems and an increased risk of delinquent behaviors in full-blown OCD, but not in OCS [11, 15]. This contradicts our findings that children with OCS also have more behavioral problems and academic and functional impairment compared to the children in the control group. These findings are plausible since executive functioning deficits have been reported in subclinical OCD [42, 43] and also in non-affected first degree relatives of OCD patients [44]. In this sense, more work needs to be done to establish how best to intervene, especially with children who present with sub-threshold OCD and OCD analogs [45].

Finally, we also found more patients in the OCD and OCS groups that had previously sought mental health services (an indirect measure of psychopathology) compared to controls. This is consistent with the literature [11, 46]. However, although a higher number of individuals in the OCD and OCS groups had previously sought mental health services in comparison to controls, only 11.7 % of subjects from the OCD group had sought (or were referred to) mental health services [8, 13]. It is possible that this phenomenon is related to the disease's clinical features (e.g.: feelings of "shame", and need for "secrecy") and a tendency to avoid situations that prompt their obsessive–compulsive thoughts and behaviors [4, 47]. Another explanation for this finding could be the shortage of available mental health services in low and middle income countries, like Brazil [48].

This study must be considered in light of its limitations. Although the categorical diagnoses of OCS and OCD complied with the DSM-IV [27] definitions, they were adapted from the DAWBA [26] items. Moreover, although trained clinicians made the diagnoses, their diagnoses were not independently validated. The absence of multiple informants reduces the confidence of data, especially for OCD due to the need of many patients to be secretive regarding their OCS. Finally, the study included a proportion of "at-risk" children, which limits generalization of our data.

However, these limitations do not preclude the relevance of the main findings of this study; *videlicet*, OCS group is

similar to OCD or holds the middle ground between full-blown OCD and control group in the presence (and type) of comorbidities, specific behavioral and social problems, clinical impact and impaired functioning. Data from this study provide further evidence that there is a psychopathological and clinical continuum between OCS and OCD, which is important not only in enhancing the understanding of the nature of OCD but in developing new diagnostic and treatment guidelines. Prospective longitudinal studies are needed to advance our understanding of the nature and course of this OCS–OCD continuum and when and how best to intervene.

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