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The relationship between obsessive-compulsive disorder and anxiety disorders: A question of diagnostic boundaries or simply severity of symptoms?

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ABSTRACT

Background: A growing number of studies are questioning the validity of current DSM diagnoses, either as "discrete" or distinct mental disorders and/or as phenotypically homogeneous syndromes. In this study, we investigated how symptom domains in patients with a main diagnosis of obsessive-compulsive disorder (OCD), panic disorder (PD) and social anxiety disorder (SAD) coaggregate. We predicted that symptom domains would be unrelated to DSM diagnostic categories and less likely to cluster with each other as severity increases.
Methods: One-hundred eight treatment seeking patients with a main diagnosis of OCD, SAD or PD were assessed with the Dimensional Obsessive-Compulsive Scale (DOCS), the Social Phobia Inventory (SPIN), the Panic and Agoraphobia Scale (PAS), the Anxiety Sensitivity Index-Revised (ASI-R), and the Beck Depression and Anxiety Inventories (BDI and BAI, respectively). Subscores generated by each scale (herein termed "symptom domains") were used to categorize individuals into mild, moderate and severe subgroups through K-means clusterization and subsequently analysed by means of multiple correspondence analysis.
Results: Broadly, we observed that symptom domains of OCD, SAD or PD tend to cluster on the basis of their severities rather than their DSM diagnostic labels. In particular, symptom domains and disorders were grouped into (1) a single mild "neurotic" syndrome characterized by multiple, closely related and co-occurring mild symptom domains; (2) two moderate (complicated and uncomplicated) "neurotic" syndromes (the former associated with panic disorder); and (3) severe but dispersed "neurotic" symptom domains.
Conclusion: Our findings suggest that symptoms domains of treatment seeking patients with OCD and anxiety disorders tend to be better conceptualized in terms of severity rather than rigid diagnostic boundaries.

1. Introduction

Despite being listed in different chapters of DSM5 [i.e. obsessive-compulsive and related disorders (OCRDs) and anxiety disorders], obsessive-compulsive disorder (OCD), social anxiety disorder (SAD) and panic disorder (PD) are closely related to each other, as shown by shared symptoms (e.g. prominent fears and avoidant behaviors) [1], co-occurrence [2], common genetic factors [3,4], increased family accommodation [5], and treatment response to serotonin reuptake inhibitors [6] and exposure-based therapies [7]. Also, the relationship between OCD, SAD and PD remain tacitly recognized in many diagnostic schemes. For instance, OCD and anxiety disorders were historically grouped under "neurotic" conditions by early theorists or simply as "anxiety disorders" across several DSM versions [8,9]. In DSM-5, despite their "splitting," the OCRDs chapter remains straight after anxiety disorders as a recognition of their close relationship [1]. Lastly, in more recent diagnostic models, such as the Hierarchical Taxonomy Of Psychopathology (HiTOP) [10], OCD and anxiety disorders are described as belonging to the same fear subfactor.

Although OCD and anxiety disorders show many commonalities, the optimal way to conceptualize the association between these conditions is not completely clear (see Fig. 1). For instance, in DSM-5, both OCD and

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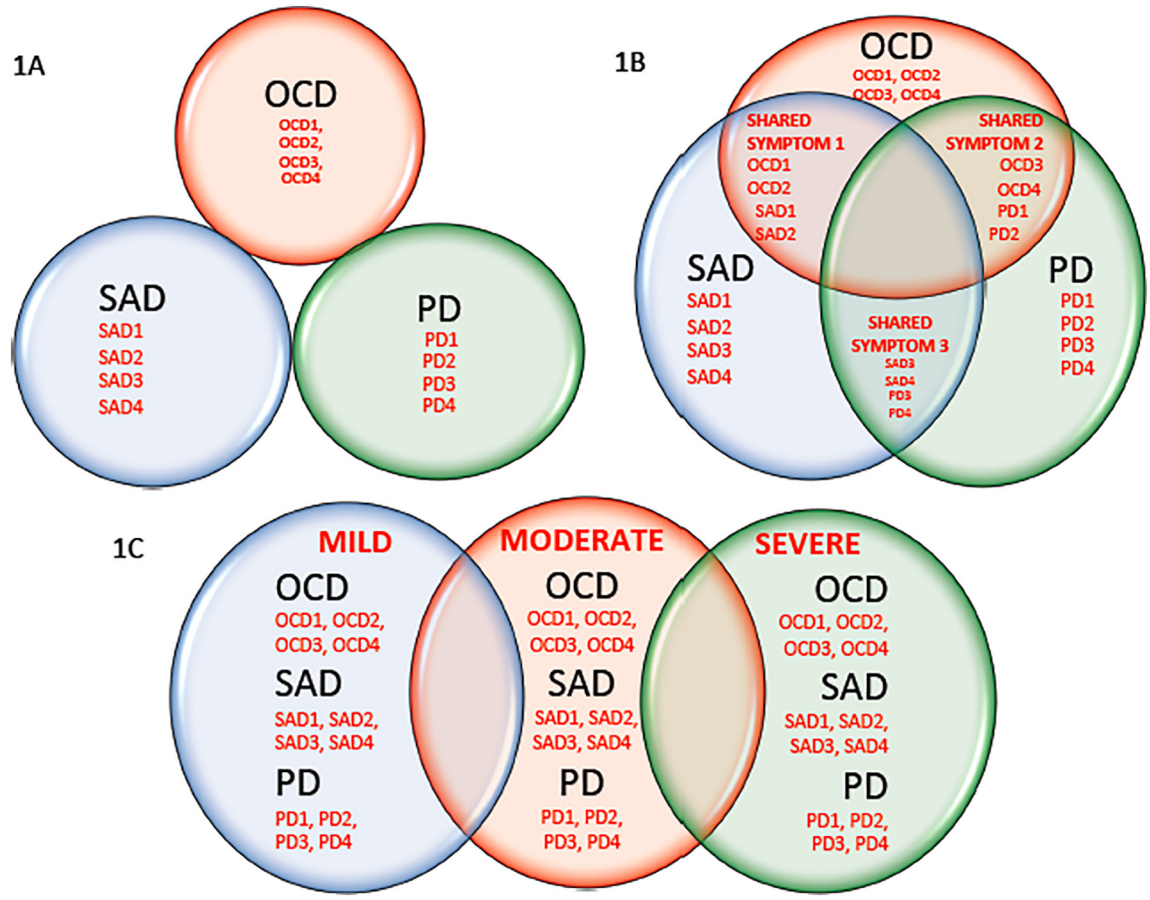

Fig. 1. Illustration of the models investigated in the present study. Model 1A depict current (DSM5) categorical conceptualization of OCD and anxiety disorders, which posits these disorders as well defined entities containing their characteristic symptoms. In this model, symptoms from different disorders may co-occur, but remain characteristic of one specific disorder. In the model 1B ("dimensional symptoms model"), symptoms from different disorders are intertwined with each other and can be shared by more than one single disorder. Finally, In the model 1C ("dimensional severity model"), OCD and anxiety disorders lie within the same spectrum of severity. OCD = obsessive-compulsive disorder; OCD1, OCD2, OCD3, and OCD4 = hypothetical OCD symptom domains; SAD = social anxiety disorder; SAD1, SAD2, SAD3, and SAD4 = hypothetical SAD symptom domains; PD = panic disorder; PD1, PD2, PD3 and PD4 = hypothetical PD symptoms domains.

anxiety disorders are considered as categories, i.e. discrete conditions with well-defined boundaries that contain defining symptoms almost unique to each diagnosis (Model 1a). In contrast, an alternative approach (a "dimensional symptoms model") acknowledges the potential co-existence of symptoms that are unique to each disorder (like DSM5) along with other shared symptoms (Model 1b). For instance, whereas some OCD phenotypes (i.e. "shameful" symptoms) seem to result in greater social anxiety [11], the performance-only subtype of SAD has been more clearly related to panic attacks than the generalized phenotype [12], and certain cognitions ("fear of dying") seem to be shared by PD and OCD [13]. Finally, in the "dimensional severity model", OCD and anxiety disorders can be considered different expressions of a common diathesis, which could then be represented along a continuum of severity (Model 1c).

In this study, to determine how the relationship between OCD, SAD and PD is best conceptualized (i.e. categorically or dimensionally), we investigated how diagnostic categories and their corresponding symptoms coaggregate in a transdiagnostic treatment seeking sample. To do so, subjects were assessed with the Mini International Neuropsychiatric Interview (MINI) to provide *diagnostic categories* and a series of *dimensional* scales that were decomposed into their subscores to provide information about the presence and severity of different OCD, SAD, and PD symptom domains. Based on the literature supporting increased comorbidity between OCD and anxiety disorders [2], and studies showing that mental disorders (including OCD [14–16] and panic disorder [17–19]) may have a history of non-specific psychopathology or "pluripotent" [20] yet milder common prodromal symptoms, we predicted that the investigated symptom domains [1] do not map into their corresponding OCD, SAD, and PD diagnostic categories and [2] are less likely to cluster together as they increase in severity.

2. Material and methods

2.1. Participants

The sample for this study included 108 individuals who were diagnosed with DSM-IV OCD ($n = 38$); SAD ($n = 34$) or PD ($n = 36$) using the Mini International Neuropsychiatric Interview (MINI) [21]. Inclusion criteria were: (i) a primary diagnosis of OCD, SAD or PD; (ii) age between 18 and 70 years; and (iii) being able to read and fill out forms. The exclusion criteria comprised severe mental disorders that could compromise the interpretation of the responses (e.g. mental retardation, current manic or psychotic episodes, or dementia) or severe personality disorders (according to the attending physician). Participants were consecutively recruited from patients who sought treatment in the Obsessive, Compulsive, and Anxiety Research Program and in the Laboratory of Panic and Respiration at the Institute of Psychiatry of Federal University of Rio de Janeiro. If eligible for the present study, the participants were informed about the study goals and invited to participate. After having signed the consent form, they completed self-report scales in the presence of a psychologist. The research ethics committee of the Institute of Psychiatry of Federal University of Rio de Janeiro has approved this research protocol (CAAE 50308015.1.0000.5263).

2.2. Severity of symptoms

In order to measure the severity of obsessive-compulsive, social anxiety, and panic symptoms, we employed, respectively, the Brazilian Portuguese versions of the Dimensional Obsessive-Compulsive Scale (DOCS), a 20-item self-report scale that provides global as well as specific scores on concerns about germs and contamination, concerns about being responsible for harm, injury, or bad luck; unacceptable (taboo) thoughts, and concerns about symmetry, completeness, and the need for things to be "just right" [22]; the Social Phobia Inventory (SPIN), a 17-item self-report instrument that, besides providing a global score, generates subscores on fear, avoidance, and physical discomfort [23]; and the Panic and Agoraphobia Scale (PAS), a 13- item self-report scale that results in total, panic attacks, agoraphobia/avoidant behaviors, anticipatory anxiety, and disability and worries about health scores [24,25].

To assess anxiety sensitivity, the Brazilian Portuguese translation of the Anxiety Sensitivity Index-36 (ASI-36) was employed. The ASI-36 is a 36-item self-report instrument that evaluates fear of anxiety-related cognitions and sensations, and behaviors that are based on beliefs about their harmful consequences, and generates global scores and subscores regarding fears of cardiovascular, respiratory, gastrointestinal and neurological symptoms, publicly observable anxiety reactions, and beliefs about cognitive dyscontrol [26]. Severities of depressive and anxious symptoms were measured with the Brazilian Portuguese versions of the Beck Depression and Anxiety Inventories (BDI and BAI, respectively) [27]. Whereas the BDI generated low self-esteem, cognitive-affective and somatic subscores [28]; BAI total scores were decomposed into neurophysiologic, subjective, panic and autonomic subscores [29].

Each of the scales subscores of all scales was split into 3 levels of severity (mild, moderate and severe) through K-means clusterization method to obtain minimal variance within each interval of the responses. For example, the first subscore of ASI-36 (fear of cardiovascular symptoms) was divided into mild, moderate and severe levels, corresponding to scores ranging from 0 to 4; 5 to 13; and 14 to 24 values, respectively. This strategy generated an additional 76 variables for our analysis (see Fig. 1 and Table 2) other than the diagnostic groups themselves (OCD, SAD and PD). K-means clusterization was performed by the software "R" (version 3.5.1).

2.3. Statistical analysis

For the analysis of differences between groups in terms of sociodemographic and clinical variables, we computed chi-square tests for dichotomous variables and analyses of variance for continuous variables. If MANOVAs indicated significant group effects, post-hoc contrasts were computed using Tukey's test. The level of statistical significance was 0.05. For these analyses, we used IBM SPSS Statistics Version 25.0 for Mac [30].

Our decision to work with symptom domains as qualitative ordinal variables lead to the choice of performing a multiple correspondence analysis (MCA) using the three diagnostic groups and the variables created from the severity of symptoms as explained above. The choice of this method allows all variables to be analysed simultaneously without the diagnostic restraints required by a bivariate analysis.

Missing values of severity of symptoms were replaced by multiple imputation through the *regularized iterative MCA algorithm*. The latter strategy guarantees an adequate treatment of the data even with non-random losses below 30%, which would be higher than what occurred in our sample (below than 10%) [31]. Both analyses were also performed by the software "R" (version 3.5.1) [32].

3. Results

The socio demographic and clinical characteristics of the sample are summarized in Table 1. They are similar to previous studies using partially overlapping subjects [33–35]. Importantly, the three groups did not differ in terms of sex ($\chi^2 = 1.57$, df = 2, $p = .45$), age (Kruskal-Wallis H = 2.145; df = 2; $p = .34$), marital status ($\chi^2 = 8.05$, df = 8, $p = .43$), professional degree ($\chi^2 = 6.22$, df = 8, $p = .62$), and comorbidity with current major depressive disorder ($\chi^2 = 0.40$, df = 2, $p = .82$). A comparison between the groups in terms of other clinical variables (e.g. including age at symptoms' onset, duration of illness, illness perception, and duration of untreated illness) has been published elsewhere [33,34].

The MCA was performed with 79 variables, including 76 severity of symptoms (divided into mild, moderate and severe) and three diagnostic groups (OCD, SAD, and PD). The MCA generated five dimensional associations between the variables that can be represented in a bidimensional graphic. In our particular case, the combination of the graphical representation of the first and second dimensions (see Fig. 2) explained better our model (30.5%). Its corresponding numerical representation can be visualized in Table 2.

All variables representing the mildest symptoms were grouped without correlating with any particular diagnostic group. Moderate symptoms, however, were more dispersed than milder symptoms, and formed two groups. A first one (termed the moderate uncomplicated "neurotic" group) involved all SPIN, BDI, and DOCS subscores; subscores 1 and 2 of BAI (neurophysiologic and subjective anxieties); subscores 1, 2 and 3 of the PAS (panic attacks, agoraphobic and anticipatory anxiety); and subscore 4 of the ASI (fear of publicly observable anxiety reactions). This first moderate group did not map into any of the three diagnostic categories.

In contrast, a second group (termed moderate complicated "neurotic" group) mapped more clearly into PD rather than on OCD or SAD. It included moderate symptoms of subscores 4 and 5 of PAS (disability and worries about health); subscore 4 of BAI (autonomic anxiety); and all subscores of ASI with the exception of ASI 4 (including fear of cardiovascular, respiratory, gastric, neurologic and cognitive dyscontrol symptoms). The only moderate symptom variable that did not clearly map into these two groups was subscore 3 of BAI (panic), which also did not map into any specific diagnostic category.

Finally, all symptom domains of higher severity (here described as the severe dispersed "neurotic" symptom domains.) did not produce a well-defined homogeneous cluster as noted in the previous two groups. Curiously, they also tended to distance themselves from the three diagnostic categories. Apparently, as severity of OCD and anxiety disorders symptoms increase, they tend to stand as prominent isolated clinical phenomena.

4. Discussion

As research on psychiatric nosology progresses, the validity of DSM diagnostic entities, either as "discrete" categorical conditions and/or as phenotypically homogeneous disorders, are being increasingly challenged. In the present study, we found evidence supporting a predominantly dimensional approach to OCD and anxiety disorders. As predicted, OCD, SAD, and PD symptom domains did not map exactly into their corresponding diagnostic categories but tended to lie within a single spectrum of severity, with milder symptom domains being more likely to cluster together. In particular, symptom domains and disorders were grouped into [1] a single mild "neurotic" syndrome characterized by multiple, closely related and milder co-occuring symptom domains; [2] two moderate (complicated and uncomplicated) "neurotic" syndromes (associated or not with panic disorder, respectively); and [3] severe but dispersed "neurotic" symptom domains.

Our findings supporting the existence of a single spectrum of severity involving all relevant OCD and anxiety disorders symptom domains are consistent with the concept of "general neurotic syndrome" initially proposed by Tyrer et al. as a combination of anxiety and depressive symptoms associated with anxious, dependent and obsessional personality traits, often interspersed with episodes of social anxiety, panic and

Table 1
Clinical and sociodemographic characteristics of participants.

Variables	OCD (N = 38)	SAD (*N* = 34)	PD (N = 36)	Statistic and *p*-value
Female (%)	18 (47.4%)	15 (44.1%)	21 (58.3%)	$X^2 = 1.576$, df = 2, $p = .455$
Age (SD)	39.37 (12.716)	42.00 (14.643)	43,89 (11.971)	Kruskal-Wallis H = 2.145; df = 2; p = .34,
Marital status (%)				$X^2 = 8.054$, df = 8, $p = .428$
Single	60.5%	58.8%	41.7%	
Married	31.6%	29.4%	30.6%	
Separated/divorced	5.3%	8.8%	19.4%	
Other	2.6%	2.9%	8.4%	
Professional degree (%)				$X^2 = 6.222$, df = 8, $p = .622$
No degree	15.8%	5.8%	22.2%	
Non-University degree	44.7%	52.9%	38.9%	
University degree	28.9%	32.4%	27.8%	
Other	10.5%	8.8%	11.1%	
Comorbid MDD (*current*)	28.1%	31.3%	315%	$X^2 = 0.40$, df = 2, $p = .819$
Cross-comorbidity between OCD, SAD, and PD (*current*)				
OCD	65.6%	3.1%	10.7%	$X^2 = 37.1$, df = 2, $p < .001$
SAD	18.8%	71.9%	0.0%	$X^2 = 39.4$, df = 2, $p < .001$
PD	6.3%	6.3%	46.4%	$X^2 = 20.8$, df = 2, $p < .001$

Footnote: OCD = obsessive-compulsive disorder; SAD = social anxiety disorder; PD = panic disorder; MDD = major depressive disorders.

somatoform symptoms [36]. It also matches the observation that a substantial number of subjects fall short of meeting diagnostic criteria for OCD [37] or other anxiety disorders [38,39], either because of the adoption of non-tested and arbitrary cut-off criteria (such as the presence of distress or impaired functioning) when they still experience substantial impairments in health, psychological vulnerability and psychiatric comorbidity [40] or because of descriptions of certain symptoms as being fundamental for diagnosis (e.g. obsessions and/or compulsions in OCD), at the expense of other, less commonly reported, but equally relevant diagnostic features (e.g. obsessional slowness [41] or sensory phenomena in OCD [42]).

The finding of a single mild "neurotic" syndrome characterized by multiple and closely related symptom domains might be consistent with the idea of an early prodromal shared pathway for OCD, SAD, and PD. This syndrome might have some overlap with traits such as increased neuroticism [43] in the absence of clinically significant symptoms or even with the so called "Clinical High At Risk Mental State" [20], where a common "pluripotent" state can differentiate itself in a number of "exit" syndromes. Alternatively, the existence of a milder cluster may reflect the fact that all anxiety disorders (and to a lesser extent OCD [44]) share similar response profiles, often to the same treatment strategies (serotonin reuptake inhibitors and exposure therapy)

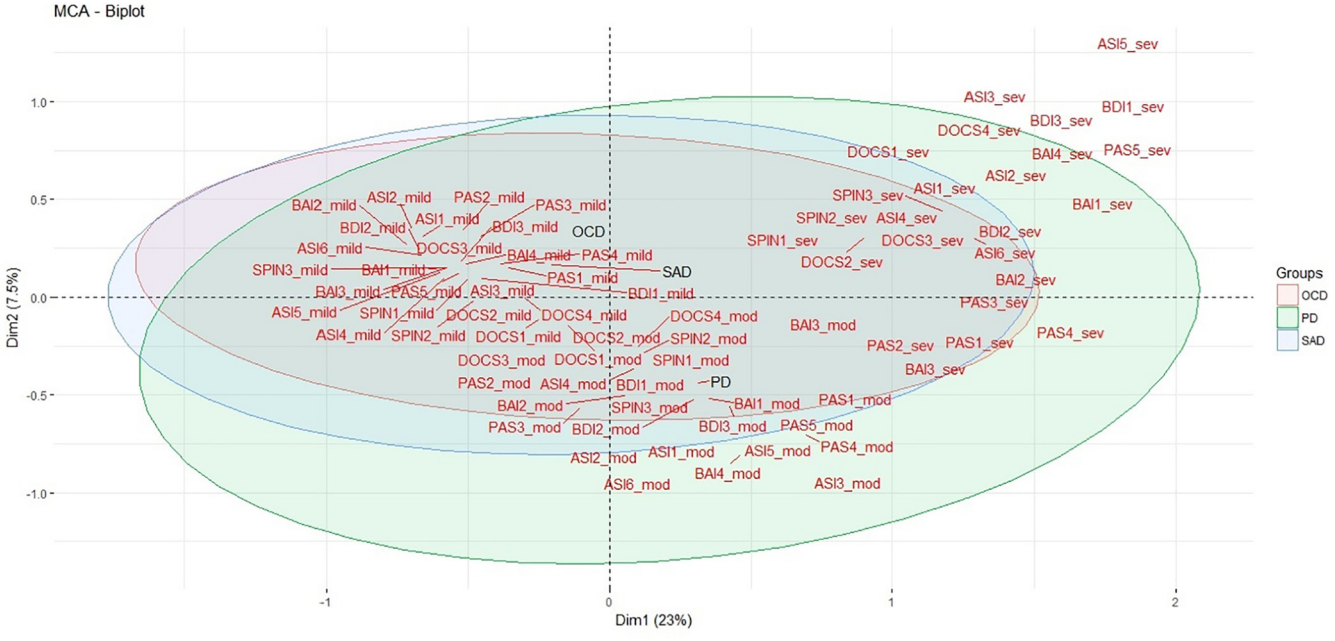

Fig. 2. Multiple correspondence analysis map of diagnostics groups and severity of symptoms (projections on the first 2 dimensions). Footnote: OCD = Obsessive-Compulsive Disorder; PD = Panic Disorder; SAD = Social Anxiety Disorder. Scales: ASI = Anxiety Sensitivity Index; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; DOCS = Dimensional Obsessive-Compulsive Scale; SPIN = Social Phobia Inventory; PAS = Panic and Agoraphobia Scale. Each item in red describes a specific symptom, i.e. the scale in question, the number of the subscore of the scale, and the severity of the specific subscore (mild = mild; mod = moderate; sev. = severe). Symptoms subscore of each scale: BDI1 = Low self-steem; BDI2 = Cognitive-afffective; BDI3 = Somatic; BAI1 = Neurophysiologic; BAI2 = Subjective; BAI3 = Panic; BAI4 = Autonomic; DOCS1 = Contamination; DOCS2 = Harm; DOCS3 = Thoughts; DOCS4 = Symmetry; SPIN1 = Fear; SPIN2 = Avoidance; SPIN3 = Physiologic arousal; ASI1 = Cardiovascular; ASI2 = Respiratory; ASI3 = Gastric; ASI4 = Fear of publicly observable anxiety reactions; ASI5 = Neurologic; ASI6 = Cognitive Dyscontrol; PAS1 = Panic Attacks; PAS2 = Agoraphobic; PAS3 = Antecipatory anxiety; PAS4 = Disability; PAS5 = Worries about health.

Table 2
The contribution of variables (each subscore split into 3 levels of severity)to the definition of the two first dimensions from multiple correspondence analysis.

	BDI1 (Low self-esteem)			BDI2 (Cognitive-affective)			BDI3 (Somatic)			BAI1 (Neurophysiologic)			BAI2 (Subjective)			BAI3 (Panic)			BAI4 (Autonomic)		
	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev
Dimension 1	0.99	0.23	2.44	1.84	0.26	2.44	1.33	0.51	2.29	1.61	0.31	3.11	2.01	0.01	3.57	1.71	1.23	1.59	1.36	0.45	2.90
Dimension 2	0.13	1.51	2.03	0.75	2.50	0.67	0.51	2.68	1.76	0.34	2.12	1.00	0.87	2.01	0.10	0.34	0.25	0.30	0.47	4.25	1.96

	DOCS1 (Contamination)			DOCS2 (Harm)			DOCS3 (Thoughts)			DOCS4 (Simmetry)			SPIN1 (Fear)			SPIN2 (Avoidance)			SPIN3 (Physiologic arousal)		
	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev
Dimension 1	0.28	0.06	1.68	0.59	0.04	1.58	0.80	0.14	2.05	0.44	0.03	1.69	0.93	0.06	1.10	1.02	0.03	1.75	1.45	0.05	2.34
Dimension 2	0.18	0.19	1.97	0.01	0.24	0.54	0.30	1.25	0.63	0.00	0.51	1.71	0.09	0.98	0.62	0.01	0.53	0.76	0.28	2.08	1.03

	ASI1 (Cardiovascular)			ASI2 (Respiratory)			ASI3 (Gastric)			ASI4 (Fear of publicly observable anxiety reactions)			ASI5 (Neurologic)			ASI6 (Cognitive Dyscontrol)		
	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev
Dimension 1	1.73	0.04	2.95	1.92	0.04	3.27	1.26	1.00	2.02	1.37	0.02	2.48	1.88	0.94	2.97	2.01	0.05	3.50
Dimension 2	1.18	5.19	1.41	1.51	6.43	1.80	0.14	4.14	2.75	0.11	1.13	0.67	0.26	4.83	4.62	0.65	4.42	0.58

	PAS1 (Panic attacks)			PAS2 (Agoraphobic)			PAS3 (Antecipatory anxiety)			PAS4 (Disability)			PAS5 (Worries about health)		
	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev	Mild	Mod	Sev
Dimension 1	0.78	0.83	1.40	1.00	0.13	2.57	0.94	0.03	3.34	0.92	0.65	2.25	1.52	0.76	2.70
Dimension 2	0.42	1.33	0.08	1.39	1.02	0.24	1.34	2.24	0.03	0.55	2.03	0.04	0.24	2.45	1.74

Footnote: ASI = Anxiety Sensitivity Index; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; DOCS = Dimensional Obsessive-Compulsive Scale; SPIN = Social Phobia Inventory; PAS = Panic and Agoraphobia Scale. Each subscore was split into 3 levels of severity (mild = mild; mod = moderate; sev = severe).

[45], which may lead to common "residual" states. In contrast, the moderate "complicated" group, which was associated with PD (and as such, with increased disability), is the reflection of a spectrum of severity of symptom domains, where the detachment of each other reaches its maximum expression in the "severe" group.

It could be argued that its small sample size and focus on treatment seeking subjects in different stages of treatment are significant limitations of this study. However, a number of additional factors need to be similarly considered. Firstly, MCA is sufficiently robust to be employed in low numbers. Secondly, treatment seeking samples might be particularly interesting for studies on the relationship between comorbid disorders, which seem to be over represented in clinical settings. Finally, although it is tempting to speculate on the existence of a common pathway whereby subjects are firstly affected by common mild neurotic symptoms to then develop later independent and more specific yet independent symptom domains, the cross sectional design of our study does not allow us to make such extrapolation. Future longitudinal studies would be interesting to clarify this important point.

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Declarations of competing interest

None.

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