

Overlap of obsessive-compulsive personality disorder and autism spectrum disorder traits among OCD outpatients: An exploratory study.

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Abstract

Background: Whereas the phenomenology of obsessive-compulsive personality disorder (OCPD) shows similarities to that of obsessive compulsive and related disorders (OCRDs) as well as with autism spectrum disorder (ASD), the relationship between these disorders is poorly understood.

Aims: Within a clinical sample, we aimed to investigate the distribution of OCD, OCPD and ASD symptoms and traits and their interrelationship, as well as to evaluate insight and treatment refractoriness.

Method: Consecutive adult OCD outpatients were assessed for OCPD traits (Compulsive Personality Assessment Scale (CPAS)), OCD symptoms (Yale–Brown Obsessive Compulsive Scale (Y-BOCS)), ASD traits (Autism Spectrum Quotient (AQ)), insight (Brown Assessment of Beliefs Scale (BABS)) and treatment resistance (clinical records). Those scoring highly on the AQ underwent a diagnostic interview for ASD.

Results: 67 consenting individuals completed the CPAS, BABS and AQ, and 65 completed the Y-BOCS. 24 patients (35.8%) were diagnosed with OCPD. Patients with OCPD were less likely to be employed ($p=.04$). They demonstrated elevated AQ scores ($p=.004$) and rates of ASD diagnosis (54.2%) ($p <.001$). OCPD traits (CPAS) showed a highly significant correlation with ASD traits (AQ) ($p<.001$), and no association with Y-BOCS, BABS or treatment resistance.

Conclusion: In an OCD cohort limited by small size, OCPD associated strongly with unemployment and ASD, with implications for diagnosis, treatment and outcome.

Keywords: Obsessive Compulsive Personality Disorder, Obsessive Compulsive Disorder, Autism Spectrum Disorders, Obsessive Compulsive and related disorders, co-morbidity.

Introduction

Obsessive Compulsive Personality Disorder (OCPD) is characterized by concern with orderliness, perfectionism, excessive attention to details, mental and interpersonal control and a need for control over one's environment at the expense of flexibility, openness to experience and efficiency (American Psychiatric Association, 2013). OCPD represents one of the commonest personality disorders but it has been the subject of comparatively little research, its nosological relationship with other disorders that involve obsessive-compulsive behaviour remains unclear and no strongly evidence-based treatments exist (American Psychiatric Association, 2013). Epidemiological estimates vary widely and a prevalence ranging from 2.1-8.7% of the population has been cited (APA, 2013; Grant et al., 2004; Zimmerman et al., 2005). In clinical psychiatry samples, the prevalence of OCPD is reported to increase to around 25% (Ansell et al., 2004; Pena-Garijo et al., 2013), and in obsessive-compulsive disorder (OCD) services, to over 30% (e.g. Diaferia et al., 1997 ; Bejerot et al., 1998; Garyfallos et al., 2010; Starcevic et al., 2012).

Some small-sized studies have suggested a relationship exists between OCPD and OCD involving particular OCD symptoms, such as need for symmetry, hoarding, checking and preoccupation with details (e.g. Eisen et al., 2006; Garyfallos et al., 2010). OCPD has also been found to be prevalent in those with early onset OCD (Pinto et al., 2006), suggesting a possible neurodevelopmental aetiology for this comorbid subgroup. Other signs of an altered neurodevelopmental trajectory, such as traits or symptoms of tic disorder, autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD), may also be observed in patients with OCD and their family members, hinting at the possibility that heritable neuro-behavioural mechanisms contribute to the expression of at least some forms of OCD (de Vries et al., 2016; Fineberg et al., 2018). However, other studies have suggested OCPD co-occurs across a broad range of OCD presentations and may reflect greater overall OCD severity (Lochner et al., 2011; Gordon et a., 2013). In a follow-up study (Wewetzer et al.,

2001), OCPD was the most frequent personality disorder (25.5 %) in young OCD patients whose diagnosis of OCD remained 11 years later, suggesting it may predict chronicity.

Whether existing alone or as a comorbid disorder, OCPD is associated with significant deficits in interpersonal function (Cain et al., 2015) and often predicts a poor response to treatment. For example, OCPD has been reported to be associated with poor CBT outcomes in OCD patients, especially when one of the diagnostic criteria, perfectionism, is more pronounced (Pinto et al., 2011). In a five-year follow-up study of 288 OCD outpatients, comorbid OCPD was associated with an increased risk of relapse (Eisen et al., 2013). Similarly, in patients with depression, comorbid OCPD is reported to be associated with poorer CBT outcomes, greater levels of distress, more complicated management strategies (Starcevic et al., 2013) and leads to a shorter time to relapse (Grilo et al., 2010). High levels of treatment utilization are reported for individuals with OCPD, even after controlling for comorbid psychiatric disorders, with notably high rates of primary health care use (Sansone et al., 2004; Sansone et al., 2003), suggesting OCPD carries a significant burden and cost for health services. For example, patients with OCPD were estimated to be three times as likely to receive psychotherapy compared with patients with major depressive disorder (Bender et al., 2001; 2006).

The nosological status of OCPD has been recently subjected to review by international diagnostic classificatory bodies such as the American Psychiatric Association DSM-5 and the World Health Organisation ICD-11 committees (Fineberg et al., 2014), alongside other obsessive-compulsive and related disorders (OCRDs). However, the relative lack of epidemiological or psychobiological data has prevented firm conclusions from being drawn. While still classified within the personality disorder grouping, OCPD has been noted to share aspects of phenomenology (preoccupation with detail, need for completeness, perfection or interpersonal control and hoarding) and neuro-psychology (behavioural or cognitive rigidity) with certain DSM-5 OCRDs, such as OCD, body dysmorphic disorder (BDD) (Jefferies –Sewell et al., 2017) and hoarding disorder (Eisen et al., 2013; Fineberg et

al., 2007; Fineberg et al., 2014; Mancebo et al., 2005). Unlike the OCRDs, OCPD is not usually characterised by the performance of motor compulsions. Nevertheless, OCPD is associated with a similarly restricted repertoire of rigid, stereotyped and disabling compulsive thinking patterns and behaviours, such as doubting, checking, hoarding, that are characteristically related to achieving completeness and intra-and inter-personal control, and that are experienced as ego-syntonic i.e. valued and believed to be rational (Fineberg et al., 2014). Absence of insight in relation to the performance of compulsive behaviours is recognised to be found in a significant proportion of patients with OCRDs (Lochner et al., 2011; Phillips et al., 2012; Toh et al., 2017) and acts as a diagnostic specifier of certain OCRDs in the DSM-5.

Alternatively, OCPD traits may be viewed as similar to those of neurodevelopmental disorders such as ASD (Fineberg et al., 2014; Hrdlicka & Dudova, 2013; Hofvander et al., 2009), though the relationship with ASD has been barely studied. In ASD, the narrow, restricted repertoire of interests and compulsive behaviours are also characteristically ego-syntonic, appearing to be designed to modulate emotional arousal e.g. by making the environment ‘feel safe’, to the extent that the risk of misdiagnosis between ASD and OCPD is considered to be high (Fitzgerald, 2002). Of note, in the DSM-III (APA, 1980), constrained emotional expression, reminiscent of autistic disorders, was classed as one of the diagnostic markers of OCPD (Samuel & Widiger, 2010). However, these traits were downplayed in later DSM versions. Nonetheless, Gillberg and Billstedt (2000), building on previous research into OCPD in eating disorders (Gillberg & Rastam, 1992; Nilsson et al., 1999), suggested “the symptomatology of OCPD, as outlined in the DSM-IV, is strikingly similar to that of autistic psychopathy as portrayed by Asperger”. Similarly, more recent work by Zucker and Losh (2008) and Lugnegård et al., (2011) has highlighted symptom-overlap between OCPD and ASD, especially in the area of restricted and repetitive behaviours and interests.

ASD is a common though often overlooked comorbidity in treatment-seeking OCD patients (Wikramanayake et al., 2017). Studies have reported a high prevalence of ASD in young people with

OCD with a negative effect on psychosocial functioning (e.g. Griffiths et al., 2017). However, the extent to which ASD and OCPD traits overlap - and, by inference, the extent to which these separately classified DSM-5 disorders (OCPD, personality disorder; ASD, neurodevelopmental disorder) may share a nosological relationship - has not so far been systematically investigated in clinical samples.

Aims and Objectives:

We extend this work by applying cross sectional survey methodology to investigate the phenomenological overlap in a treatment-seeking sample of OCD patients, in which we expected to find a high level of OCPD and ASD, to shed further light on the complex clinical relationship between OCPD, OC RD (in this case OCD) and ASD. As far as we are aware, this is the first study to specifically explore the association between OCPD and ASD traits in this clinical population.

Based on the existing literature, we explored the hypotheses that the presence and strength of OCPD traits would correlate positively with 1) OCD severity, 2) the presence of specific OCD symptoms recognized to overlap with traits known to be associated with a diagnosis of OCPD such as symmetry and hoarding obsessions and checking, ordering and hoarding compulsions, 3) ASD-severity, 4) impaired insight (based on the ego-syntonic nature of OCPD psychopathology) and 5) treatment resistance.

Method

The study was approved by the East of England NHS Research Ethics Committee.

We approached 106 consecutive patients attending a UK Specialised OCD Service, including a subgroup of highly treatment resistant cases (n=31), over a period from March 2013 to September

2014, of whom 73 consented to be interviewed for the study. All patients fulfilled DSM-5 criteria for OCD based on extensive interviews with experienced clinicians.

A separate analysis derived from a similar cohort that investigated the prevalence and distribution of ASD traits is now published (Wikramanayake et al., 2017). In that study, approximately one third of the OCD sample demonstrated clinically relevant ASD psychopathology. However, the analysis by Wikramanayake et al. 2017, did not investigate the overlap between ASD and OCPD traits, the latter being the focus of this study. In addition, the number of study participants included in this analysis differs from that of Wikramanayake et al. 2017.

We evaluated the presence and severity of OCPD traits using the observer-rated Compulsive Personality Assessment Scale (CPAS) (Fineberg et al., 2007) that evaluates each of the eight DSM-5 diagnostic criteria on an ordinal scale of 0-4 (maximum total CPAS =32) based on a semi-structured interview with a clinician experienced in the treatment of OCRDs. The CPAS has not been validated systematically in a clinical sample of patients with OCPD. However, it has face validity, mapping directly on each of the diagnostic criteria of OCPD, and has been used to quantify OCPD traits in other work e.g. in a non-clinical sample where CPAS scores were found to correlate with various neurocognitive features of OCPD (Fineberg et al., 2015), and in patients with mood and anxiety disorders where CPAS scores correlated with clinical factors including fatigue (Burkauskas et al., 2018). Consistent with the DSM-5, we operationally (and arguably conservatively) defined a diagnosis of OCPD as a score of 3 (severe) or 4 (very severe) on at least 4 CPAS items.

We administered the clinician-rated Yale–Brown Obsessive Compulsive Scale (Y-BOCS) and checklist to measure respectively the OCD symptom severity and profile (Goodman et al., 1989a, 1989b; Woody et al., 1995). This scale is considered to be the pivotal rating scale for measuring symptom-severity in OCD (Reghunandanan & Fineberg, 2012) and is recognized to have good psychometric properties (Rapp et al., 2016). Completed by the clinician in a semi-structured interview, it is a 10-

item questionnaire, 5 looking into obsessions and 5 into compulsion over the past week; each item is rated on a scale from 0 to 4 with a maximum total score of 40.

The 50-item self-reported questionnaire, Autism Spectrum Quotient (AQ) was completed to screen for ASD traits (Baron-Cohen et al., 2001), with each domain represented by 10 categorical statements. A score of 26 or more on the AQ is considered to indicate a high likelihood of ASD (Wikramanayake et al., 2017). It has been demonstrated that the AQ can correctly identify patients who fulfil a diagnosis of ASD, with a specificity of 0.52 and sensitivity of 0.95 (Woodbury-Smith et al., 2005).

All the above scales were administered by the treating clinician.

Patients scoring 26 or more on the AQ were further interviewed by experienced psychiatrists working as clinicians within our OCD service, for the presence of ‘clinical estimate ASD’ using a semi-structured interview, lasting between 30 and 45 minutes each. This involved systematic questioning relating to each of the core diagnostic symptoms of ASD, according to the DSM-IV-TR. The interview was audio-taped and evaluated collectively by four clinicians with expertise in the assessment of ASD and OCD who were not necessarily involved in the patient’s treatment. A clinical estimate diagnosis of ASD, approximating to DSM-IV, was reached based on a predetermined consensus principle (see Wikramanyake et al., 2017). To ensure agreement between the four clinicians, independent intra-class correlation coefficients were calculated for diagnosis: .90 [95% CI .78, .95], as well as the three types of symptoms; Social reciprocity: .93 [.85, .97], Communication: .92 [.82, .96], Repetitive behaviour: .83 [.65, .92] suggesting a strong degree of inter-rater reliability.

The Brown Assessment of Beliefs Scale (BABS), a reliable and valid instrument for assessing delusionality in a number of psychiatric disorders including OCD (Eisen et al., 1998), was used to measure the degree of impairment of insight. The BABS is a clinician-rated scale scored on a four-point Likert scale from 0-4 for each of the points covered. The seven dimensions measured include

levels of conviction, perception of others' views of beliefs, explanation of differing views, fixity of ideas, attempts to disprove ideas, insight and ideas or delusions of reference over the past week.

We also reviewed the clinical case notes to obtain further information on clinical diagnosis and treatment history. Treatment resistance was judged according to the patient's treatment history with regards to previous pharmacological treatment and psychological therapies. (see Wikramanyake et al., 2017). This staging was designed for the purpose of this study based on current evidence-based treatment algorithms for OCD (Reghunandanan et al., 2015). Patients were grouped into 7 different stages of treatment-resistance, according to prior usage of evidence-based pharmacological treatment and psychological therapies for OCD. We defined 'highly resistant OCD 'as those cases falling within stage 6 and 7 i.e. failed at least two courses of cognitive behaviour therapy (CBT) including home-based therapy or evidence-based pharmacological therapy augmented with antipsychotic or high dose SSRI or novel compounds.

Analysis

The data was analyzed with Stata 13.1. When comparing groups on continuous dependent variables, independent samples t-tests were used. Chi squared analysis was performed to compare groups on categorical variables. Non parametric analysis using Spearman's rho correlation was conservatively used to explore the relationship between OCPD, OCD and ASD severity scores in case the assumption of linearity was violated. Missing data was defined as insufficient data recorded in the database to enable estimation of a scale score. As such, if any one of the rating scale scores could not be estimated for a particular participant, the sample size for that analysis would be adjusted accordingly, but the participant would not be totally excluded from the study.

Results

67 consenting individuals (52.2 % female; mean age 44.5 years, SD+/- 11.47) completed the CPAS, BABS and AQ, and 65 completed the Y-BOCS. Their demographic and clinical details are depicted in table 1. Twenty-four patients (35.8%; 10 males, 14 females) met the operational diagnostic criteria for OCPD, based on the CPAS. Sixteen (66.7%) of these patients either had previously received an established diagnosis of OCPD written in the clinical case notes (n=10), or there was mention of “obsessional personality traits” or “possible” or “probable OCPD” (n=6).

Patients with OCPD showed significantly greater scores on the AQ (with OCPD M = 28.04, SD 7.15; without OCPD M=22, SD=7.92; t (65) = 3.1, p = .003), with a large effect size (.78) (see table 1). In contrast, there was no significant difference between the groups in terms of OCD symptom severity (Y-BOCS) or insight (BABS). Also, there was no between-group difference in gender ratio, age, age of onset of OCD or age of diagnosis of OCD. Regarding employment status, 27 were employed, 34 registered unemployed, two were not working owing to illness, two were retired and there was missing data for two cases. Those with OCPD had significantly lower rates of employment (17 (74%) unemployed; p=.04).

[Table 1 about here]

Distribution of OCPD traits.

The frequency of total CPAS scores, representing the number of OCPD traits and their severity, in the total sample resembled a normal distribution (figure 1) with a mean score of 13.79, SD+/- 7.75.

[Figure 1 about here]

Certain OCPD traits were more commonly endorsed than others within the OCD sample i.e. severe or very severe (CPAS score >=3 out of 4) over-conscientiousness (55.22% cases), perfectionism

(53.7% cases), preoccupation with detail (40.2% cases), rigidity (37.3% cases), and need for control (34.3% cases) (figure 2). Severe or very severe hoarding behaviour was endorsed by 29.8% of the sample. As with other studies, miserliness was endorsed the least (13.4%).

[Figure 2 about here]

Association between OCPD traits and OCD symptoms.

Analysis of the relationship between the severity of OCPD traits (as measured by CPAS) and OCD (as measured by Y-BOCS) scores, using Spearman's Rho, demonstrated a weak positive correlation that was statistically insignificant ($r_s = .2168$, $n = 65$, $p = .08$). Similarly, analysis of the relationship between OCPD and the Y-BOCS obsessions and compulsions subscales produced only weak positive correlations (respectively $r = .2137$, $n = 64$, $p = .09$, $r = .2294$, $n = 64$, $p = .07$) that were also statistically insignificant.

We additionally explored the relationship between the presence of OCPD and specific OCD symptom domains as defined in the Y-BOCS checklist (Table 2). We found a significant increase in the presence of OCPD in those with hoarding obsessions only ($\chi^2 = 4.16$, $p = .04$).

[Table 2 about here]

Association between OCPD and ASD traits.

Analysis of the relationship between the severity of OCPD traits (as measured by CPAS) and ASD traits (as measured by AQ) using Spearman's Rho demonstrated a moderate and highly significant positive correlation between the two variables, $r_s = .40$, $n = 67$, $p < .001$, as well as between the CPAS scores and the scores falling within three individual AQ domains, namely attention-switching ($r_s =$

.44, p<.01), attention to detail ($r_s = .39$, p = <.01) and social communication ($r_s = .28$, p = .02). The correlation between CPAS scores and the social skills AQ domain was more modest and statistically insignificant ($r_s = .21$, p = .08). There was no correlation between CPAS scores and the fifth AQ domain (imagination).

Association between OCPD and ASD

Thirty-four of the original sample of 67 OCD patients (50.75%) exceeded the total AQ threshold score of 26, representing a high overall frequency of ASD traits. Of these high scoring cases, 21 (61.77%; 31.34% of the full sample) were given an estimate ASD diagnosis (12 Asperger's syndrome, 2 Autism, 7 pervasive developmental disorder not otherwise specified (PDD NOS)) on the Autism Spectrum Diagnostic Assessment. None of these patients had received a documented diagnosis of ASD in the clinical notes.

In the [OCPD+OCD] sub-group, as many as 16 (66.66%) scored ≥ 26 on the AQ. Compared to the OCD patients without OCPD, this represents a significantly increased rate of those exceeding the AQ threshold score ($X^2(1) = 8.3$, p = .004). In addition, thirteen patients (54.2%) in the [OCPD+OCD] sub-group received a clinical estimate diagnosis of ASD (9 Asperger's syndrome, 1 Autism, 3 PDD NOS). This finding represents a highly significant overrepresentation of ASD in the OCPD subgroup ($X^2 (1) = 12.26$, P<.001).

We additionally analysed the subgroups with and without a clinical estimate diagnosis of ASD in relation to each of the CPAS items. We found that those with ASD (n=19, two missing cases) were significantly more likely to endorse a need for control ($X^2 (1) 8.62$ (p=.003)), over-conscientiousness ($X^2 (1) 6.03$ (p=.01)), workaholism ($X^2 (1) 8.96$ (p=.003)), preoccupation with detail ($X^2 (1) 4.97$ (p=.03)), perfectionism ($X^2 (1) 4.25$ (p=.04)), and rigidity ($X^2 (1) 3.41$ (p=.07) borderline), suggesting

that these are the OCPD traits most closely linked to a diagnosis of ASD, at least in the OCD population.

Association between OCPD and insight

The total CPAS scores were not associated with measures of insight on the BABS ($r_s = .07, p = .57$).

Association between OCPD and treatment-resistance

Psychological treatment was received by all but four patients. In addition, all but one received treatment with SSRI, three were prescribed clomipramine, 11 received adjunctive antipsychotic, four anxiolytics and one hypnotic medication. 31 patients (46% of the whole sample) were operationally classified as highly resistant OCD according to our staging criteria (treatment stages 6, 7). OCPD was not over-represented in the highly resistant OCD subgroup ($\chi^2 (1) = 0.3615, p = .55$).

Discussion

As expected, we found a high level of OCPD and ASD traits in the OCD sample. Moreover, we confirmed one of our a priori hypotheses i.e. of a moderate and highly significant positive correlation between OCPD and ASD-severity. However, against expectation, we did not confirm the remaining hypotheses. Specifically, we did not find that the strength of OCPD traits correlated positively with either overall OCD severity, or with the presence of many specific OCD symptoms recognized to overlap with traits known to be associated with a diagnosis of OCPD, apart from hoarding obsessions, or with impaired insight, or with treatment resistance.

OCPD traits in the OCD sample

In our OCD sample, as many as 35.8% of individuals fulfilled diagnostic criteria for OCPD. We have confidence in the diagnosis as two thirds of those fulfilling our operational criteria were co-incidentally noted by their treating clinicians to have OCPD traits in the clinical case notes. These findings also suggest the OCPD traits were thought to be of clinical significance to the patient by the treating teams. The frequency of OCPD in our study is comparable with that seen in previous studies (Bejerot et al., 1998; Starcevic et al., 2013), and exceeds the population rate of OCPD (up to 8.7%), in line with a theoretical association between OCD and OCPD. No previous study, to the best of our knowledge, has commented on the distribution of OCPD severity in an OCD sample, which in our study resembled a normal distribution, with the majority of patients scoring approximately midway on the total CPAS (mean total CPAS=13.75; SD 7.79). There was no obvious ‘cut-off’ between those with low and high levels of OCPD traits.

Impact of presence of OCPD traits

In our study, patients with OCPD were significantly less likely to be employed, suggesting a possible relevant impact of the diagnosis on occupational function (discussed further below). However, as this was not an a priori hypothesis, this result needs to be interpreted with caution as the risk of type one error is elevated. There were, however, no statistically significant differences between those with and without OCPD in regard to their gender, reported age of onset of OCD (unlike Garyfallos et al., 2010), or age at diagnosis. Moreover, unlike other studies showing a specific association between OCPD and certain OCD symptoms (Garyfallos et al., 2010; Starcevic et al., 2013), and rather more like the results of studies by Lochner et al., (2011) and Gordon et al., (2013), the presence of OCPD was only significantly linked with one specific OCD domain, that of hoarding obsessions, which may represent an artefact as hoarding behaviour is also used to define OCPD. It is possible that the relatively small sample size obscured other significant correlations in our study.

However, taken together, these findings suggest that all OCD patients, as opposed to a restricted phenotypic subgroup, are susceptible to OCPD to a greater or lesser degree.

OCPD traits

The most frequently endorsed OCPD traits in our sample were over-conscientiousness, perfectionism, preoccupation with detail, rigidity and need for control, whereas miserliness was the least endorsed as mentioned in other studies (such as Hummelen et al., 2008; McGlashan et al., 2005; Sanislow et al., 2002).

The above mentioned most frequently endorsed OCPD traits, together with workaholism, were also strongly associated with a diagnosis of ASD (see below). Perfectionism, rigidity, need for control and workaholism may be viewed as detrimental with respect to interpersonal relationships. These traits may also lead to conflict at work and thereby explain the elevated rates of unemployment seen in our patients with this comorbidity. The impact of OCPD on employment is not well understood and merits further qualitative study. Our findings, however, also endorse the high prevalence of over-conscientiousness in this group that, as a domain, is not usually viewed by others as being detrimental and may even be viewed as adaptive e.g. for occupational roles requiring high levels of scrupulosity (reviewed in Chamberlain et al., 2017), but which can have damaging consequences on the individual themselves associated with the intrapersonal effort of sustaining high standards of moral behaviour and may be linked to the development of depression. Unfortunately, we did not measure depressive symptoms in this study, which would be another fruitful next research step.

Impact of OCPD on OCD severity and treatment resistance

As regards the effect of OCPD on OCD severity or treatment-resistance, the evidence supporting a positive correlation has, to date, been equivocal. For example, Gordon et al. (2013) found greater self-reported OCD symptom severity in patients with OCPD that was limited to certain OCD symptoms only i.e. doubting, ordering, and hoarding. Lochner et al. (2011) suggested that OCPD may

represent a marker of OCD severity based on its association with a broad range of OCD symptoms. This study found a statistically insignificant correlation between the magnitude of CPAS and Y-BOCS, providing no support for the hypothesis that OCPD reflects more severe OCD. Moreover, we did not find OCPD traits to be associated with greater treatment resistance. However, our sample size was not large; a larger study would provide more conclusive results.

OCPD and ASD

In contrast to the limited evidence of association between OCPD and OCD severity or subtype, there was a strong overlap between OCPD and the co-occurrence of traits and diagnosis of ASD, to the extent that approximately half (54.2%) of those diagnosed with OCPD were also found to meet diagnostic criteria for ASD. Unlike the diagnosis of ASD, which had been overlooked prior to this study, OCPD had been noted in the main by the treating clinicians. Thus, our findings only partially support the proposal that OCPD and ASD may be commonly mistaken for each other (Fitzgerald, 2002), at least in the OCD population as the presence of OCPD seemingly overshadowed the clinical recognition of ASD. Our findings do, however, suggest that the presence of OCPD and in particular those OCPD traits that were most significantly over-represented in those with an estimate diagnosis of ASD i.e. need for control, over-conscientiousness, workaholism, preoccupation with detail, perfectionism and rigidity - should alert the clinician to the possible co-occurrence of ASD. They additionally raise the question as to the extent to which the two early-onset disorders may share aetiology and neuropsychological mechanisms.

Alongside phenomenological similarities, there is emerging evidence of shared neurobiology among OCPD and ASD. Research on twins suggest that OCPD is highly heritable (Torgersen et al., 2000; Gjerde et al., 2015) and there is evidence that OCPD, OCRDs and ASD cluster not only in the same patients (Hofvander et al., 2009) but also in their family members (Nestadt et al., 2000; Samuels et al., 2000; Serpell et al., 2002; Anderluh et al., 2003; Hollander et al., 2003; Calvo et al., 2009; Bienvenu et al., 2012; Özyurt & Beşiroğlu, 2018), suggesting that these disorders may share genetic

factors in their aetiology. Hollander et al. (2003) reported that the occurrence of obsessive-compulsive traits or disorder in the parents of autistic children is significantly more likely if autistic children have a high occurrence of repetitive behaviours, additionally indicating a possible role for ‘compulsivity’ as a neuropsychological factor mediating familial risk across OCD, OCPD and ASD diagnoses.

Endophenotypes, representing intermediate markers of psychopathology, are particularly helpful for identifying the brain-based determinants of disorders such as OCPD, as they are less susceptible to variation than are phenotypic markers, and may be relatively easily accessed. Cognitive inflexibility, as demonstrated by abnormal performance on the extra dimensional domain of the intra-extradimensional set-shift task (IED) (Fineberg et al., 2015), shows ecological validity for disorders characterised by compulsive behaviour and been reported in people with OCPD (Fineberg et al., 2015) as well as OCRDs such as OCD, body dysmorphic disorder (Jefferies-Sewell et al., 2017), hoarding disorder (Morein-Zamir et al., 2014) and ASD (Brady et al., 2013; De Vries & Geurts, 2012), suggesting that these disorders share common neuropsychological processes (Fineberg et al., 2018). Carlisi and colleagues (2017 a,b,c), in a series of studies comparing patients with ASD and OCD, recently found disorder-specific and shared structural and functional brain abnormalities associated with vigilance processing, neuro-computational mechanisms of decision-making and inhibitory control. No such studies directly comparing ASD with OCPD have so far been performed.

Our study identified particularly strong correlations between specific ASD domains and OCPD scores, including problems in attention-switching, representing a measure of cognitive rigidity (De Vries & Geurts, 2012), which may reflect similar attentional set-shift changes as previously reported in OCPD using the intra-extradimensional set-shift task (Jefferies-Sewell et al., 2014), and excessive attention to detail, thought to reflect poor ‘central coherence’, which has so far been little researched in OCPD. These domains may reflect shared trans-diagnostic neuropsychological endo-phenotypes exerting a pathoplastic effect across OCPD and ASD (as well as potentially other OCRDs).

The additional findings of an association between the presence of OCPD and poor social communication and to a lesser extent poor social skills, were unexpected and novel. Communication problems are not traditionally emphasised in the descriptions of OCPD (though many clinicians would endorse this as a cardinal feature). Indeed, the finding of a significant correlation between poor social communication and OCPD argues against the proposal that the relationship between OCPD and ASD is attributable to shared similarities on the measures assessing these traits (see Limitations) because the CPAS does not include measures of social communication. Poor social communication may explain why people with OCPD find interpersonal relationships so difficult (Cain et al., 2015) and the high rates of marital disharmony reported for this group (Reddy & Maitri, 2015; Reddy et al., 2016) with reports of explosive aggressive outbursts. (e.g. Villemarette-Pittman et al., 2004). They may also explain the high rates of unemployment seen in this study. A better understanding of the nature of communication problems in OCPD is required to determine how closely these resemble ASD and may additionally serve as a new and fruitful target for treatment in this group, including a potential role for occupational therapy. Such therapy may involve group-based or individual-based social learning programmes focused on improving social interaction, and include interventions such as modelling, peer feedback (for group-based programmes) or individual feedback (for individually delivered programmes), discussion and decision-making, and suggested strategies for dealing with socially difficult situations, as recommended by the UK National Institute for Health and Clinical Excellence for adults with ASD (National Collaborating Centre for Mental Health, 2012). If further validated in cases of OCPD using larger studies in which the confounding effect of ASD can be controlled for, consideration should also be given to re-introducing poor social communication as a criterion in any future diagnostic revision of OCPD.

OCPD and insight

Unexpectedly, insight was not seemingly impaired in the presence of OCPD traits. This finding is interesting and conflicts with the clinical experience of compulsive behaviours associated with OCPD

being valued or justified (egosyntonic). Possibly this finding reflects the difficulties inherent in adequately evaluating insight in the context of OCRDs. This has been recently discussed in work by Brakoulias and colleagues (Brakoulias et al., 2017; Starcevic & Brakoulias, 2018), who suggest that existing scales, such as the BABS, that are designed for evaluating insight in psychosis may not capture the more subtle changes in insight seen in OCRDs (such as the ‘disconnect’ between knowing and believing) and who have proposed new rating scales for this purpose that future research in this field may benefit from.

Implications

OCPD is common in OCD and is associated with occupational disability. OCPD traits overlap strongly with ASD traits and indicate a high likelihood of comorbid ASD that is usually missed by clinicians. However, ASD is also common in OCD even in the absence of OCPD.

Poor social communication, as well as cognitive inflexibility and poor central coherence are found in the presence of OCPD, further highlighting the close relationship with ASD.

These exploratory results hint at shared aetiological factors of relevance for further clinical study to advance diagnostic classification and potential new avenues for therapeutic intervention. Further neurosciences research e.g. neuropsychological tests or brain imaging analysis is indicated to clarify the extent of the neurobiological relationship between OCPD and ASD.

Key points

- Clinicians should exercise a high level of vigilance for OCPD and ASD in patients presenting with obsessive compulsive symptoms.

- The presence of OCPD may indicate a likelihood of disabling ASD traits, including cognitive inflexibility, poor central coherence and poor social communication.
- These neuropsychological factors may require separate clinical intervention strategies.

Limitations

We acknowledge that the study has a small sample size rendering it susceptible to statistical weakness such as the high probability of both type 1 and type 2 errors. As an exploratory study, it was aimed at generating hypotheses for onwards testing in larger well powered studies including community-based surveys. Moreover, our use of several comparisons with relationship to unemployment, age of onset, specific OCPD traits, AQ domains may lead to a risk of inflated Type 1 errors.

Our sample was derived from a specialist clinic and therefore may not be representative of all OCD patients. However, there was no obvious increase of OCPD in the more severely ill and resistant patients in the sample, suggesting that the findings do apply broadly to OCD. Testing the association in community-based surveys of OCD would be a rational next step.

Owing to the considerable overlap between OCPD and ASD traits, it is difficult to attribute associated factors, such as unemployment rates to one or other specific diagnosis.

The overlap between OCPD and ASD traits observed in this study might stem from overlapping symptom endorsements on the respective scales, for reasons other than being due to common psychopathological mechanisms and thereby might have led to an over-inflation of the perceived inter-relationship between the disorders.

Compared with the positive correlations found between the AQ and CPAS, which scales measure longstanding ASD and OCPD traits, we found low correlations with measures assessing state

symptoms e.g. Y-BOCS and BABS, which may at least in part be explained by the fact that state measures are inherently less stable.

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References

- Albert, U., Maina, G., Forner, F., & Bogetto, F. (2004). DSM-IV obsessive-compulsive personality disorder: Prevalence in patients with anxiety disorders and in healthy comparison subjects. *Comprehensive Psychiatry*, 45(5), 325-332. doi: 10.1016/j.comppsych.2004.06.005
- American Psychiatric, A., & American Psychiatric Association, D. S. M. T. F. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed.). Arlington, Va;London;: American Psychiatric Association.
- Anderluh, M. B., Tchanturia, K., Rabe-Hesketh, S., & Treasure, J. (2003). Childhood Obsessive-Compulsive Personality Traits in Adult Women With Eating Disorders: Defining a Broader Eating Disorder Phenotype. *American Journal of Psychiatry*, 160(2), 242-247. doi: 10.1176/appi.ajp.160.2.242
- Ansell, E. B., Pinto, A., Crosby, R. D., Becker, D. F., Añez, L. M., Paris, M., et al. (2010). The prevalence and structure of obsessive-compulsive personality disorder in Hispanic psychiatric outpatients. *Journal of Behavior Therapy and Experimental Psychiatry*, 41(3), 275-281. doi: 10.1016/j.jbtep.2010.02.005
- Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). The Autism-Spectrum Quotient (AQ): Evidence from Asperger Syndrome/High-Functioning Autism, Malesand Females, Scientists and Mathematicians. *Journal of Autism and Developmental Disorders*, 31(1), 5-17. doi: 10.1023/A:1005653411471
- Bejerot, S., Ekselius, L., & von Knorring, L. (1998). Comorbidity between obsessive-compulsive disorder (OCD) and personality disorders. *Acta Psychiatrica Scandinavica*, 97(6), 398-402. doi: 10.1111/j.1600-0447.1998.tb10021.x
- Bender, D. S., Dolan, R. T., Skodol, A. E., Sanislow, C. A., Dyck, I. R., McGlashan, T. H., et al. (2001). Treatment Utilization by Patients With Personality Disorders. *American Journal of Psychiatry*, 158(2), 295-302. doi: 10.1176/appi.ajp.158.2.295
- Bender, D. S., Skodol, A. E., Pagano, M. E., Dyck, I. R., Grilo, C. M., Shea, M. T., et al. (2006). Prospective assessment of treatment use by patients with personality disorders. *Psychiatric Services*, 57(2), 254-257.
- Bienvenu, O. J., Samuels, J. F., Wuyek, L. A., Liang, K. Y., Wang, Y., Grados, M. A., et al. (2012). Is obsessive-compulsive disorder an anxiety disorder, and what, if any, are spectrum conditions? A family study perspective. *Psychological Medicine*, 42(1), 1-13. doi: 10.1017/S0033291711000742
- Brady, D. I., Schwean, V. L., Saklofske, D. H., McCrimmon, A. W., Montgomery, J. M., & Thorne, K. J. (2013). Conceptual and Perceptual Set-shifting executive abilities in young adults with Asperger's syndrome. *Research in Autism Spectrum Disorders*, 7(12), 1631-1637. doi: 10.1016/j.rasd.2013.09.009
- Brakoulias, V., Starcevic, V., Milicevic, D., Hannan, A., Viswasam, K., & Brown, C. (2018). The Nepean Belief Scale: preliminary reliability and validity in obsessive-compulsive disorder. *International Journal of Psychiatry in Clinical Practice*, 22(2), 84-88. doi: 10.1080/13651501.2017.1374413
- Burkauskas, J., Fineberg, N. A., Gecaite, J., Juskiene, A., Podlipskyte, A., Neverauskas, J., et al. (2018). Obsessive Compulsive Personality and Fatigue in Patients with Anxiety and Mood Disorders. *European Neuropsychopharmacology*, 28(6), 781-782. doi: 10.1016/j.euroneuro.2017.10.030
- Cain, N. M., Ansell, E. B., Simpson, H. B., & Pinto, A. (2015). Interpersonal Functioning in Obsessive-Compulsive Personality Disorder. *Journal of Personality Assessment*, 97(1), 90-99. doi: 10.1080/00223891.2014.934376
- Calvo, R., Lázaro, L., Castro-Fornieles, J., Font, E., Moreno, E., & Toro, J. (2008). Obsessive-compulsive personality disorder traits and personality dimensions in parents of children with obsessive-compulsive disorder. *European Psychiatry*, 24(3), 201-206. doi: 10.1016/j.eurpsy.2008.11.003

- Carlisi, C. O., Norman, L., Murphy, C. M., Christakou, A., Chantiluke, K., Giampietro, V., et al. (2017). Disorder-Specific and Shared Brain Abnormalities During Vigilance in Autism and Obsessive-Compulsive Disorder. *Biological psychiatry. Cognitive neuroscience and neuroimaging*, 2(8), 644.
- Carlisi, C. O., Norman, L., Murphy, C. M., Christakou, A., Chantiluke, K., Giampietro, V., et al. (2017a). Comparison of neural substrates of temporal discounting between youth with autism spectrum disorder and with obsessive-compulsive disorder. *Psychological Medicine*, 47(14), 2513-2527. doi: 10.1017/S0033291717001088
- Carlisi, C. O., Norman, L., Murphy, C. M., Christakou, A., Chantiluke, K., Giampietro, V., et al. (2017b). Shared and Disorder-Specific Neurocomputational Mechanisms of Decision-Making in Autism Spectrum Disorder and Obsessive-Compulsive Disorder. *Cerebral Cortex*, 27(12), 5804-5816. doi: 10.1093/cercor/bhx265
- Carlisi, C. O., Norman, L. J., Lukito, S. S., Radua, J., Mataix-Cols, D., & Rubia, K. (2016). Comparative Multimodal Meta-analysis of Structural and Functional Brain Abnormalities in Autism Spectrum Disorder and Obsessive-Compulsive Disorder. *Biological Psychiatry*, 82(2), 83-102. doi: 10.1016/j.biopsych.2016.10.006
- Chamberlain, S. R., Leppink, E. W., Redden, S. A., Stein, D. J., Lochner, C., Grant, J. E. (2017). Impact of obsessive-compulsive personality disorder (OCPD) symptoms in Internet users. *Annals of Clinical Psychiatry*, 29(3): 173–181.
- Davis, C., Kaptein, S., Kaplan, A. S., Olmsted, M. P., & Woodside, D. B. (1998). Obsessionality in anorexia nervosa: The moderating influence of exercise. *Psychosomatic Medicine*, 60(2), 192-197. doi: 10.1097/00006842-199803000-00015
- De Vries, F. E., Cath, D. C., Hoogendoorn, A. W., van Oppen, P., Glas, G., Veltman, D. J., et al. (2016). Tic-Related Versus Tic-Free Obsessive-Compulsive Disorder : Clinical Picture and 2-Year Natural Course. *Journal of Clinical Psychiatry*, 77(10), e1240-E1240. doi: 10.4088/JCP.14m09736
- De Vries, M., & Geurts, H. M. (2012). Cognitive flexibility in ASD: Task switching with emotional faces. *Journal of Autism and Development Disorders*, 42(12), 2558-2568. doi: 10.1007/s10803-012-1512-1
- Diaperia, G., Bianchi, I., Bianchi, M. L., Cavedini, P., Erzegovesi, S., & Bellodi, L. (1997). Relationship between obsessive-compulsive personality disorder and obsessive-compulsive disorder. *Comprehensive Psychiatry*, 38(1), 38-42. doi: 10.1016/S0010-440X(97)90051-1
- Eisen, J. L., Phillips, K. A., Baer, L., Beer, D. A., Atala, K. D., & Rasmussen, S. A. (1998). The Brown Assessment of Beliefs Scale: Reliability and Validity. *American Journal of Psychiatry*, 155(1), 102-108. doi: 10.1176/ajp.155.1.102
- Eisen, J. L., Coles, M. E., Shea, M. T., Pagano, M. E., Stout, R. L., Yen, S., ...Rasmussen, S. A. (2006). Clarifying the convergence between obsessive compulsive personality disorder criteria and obsessive compulsive disorder. *Journal of Personality Disorders*, 20(3): 294-305.
- Eisen, J. L., Sibrava, N. J., Boisseau, C. L., Mancebo, M. C., Stout, R. L., Pinto, A., et al. (2013). Five-Year Course of Obsessive-Compulsive Disorder: Predictors of Remission and Relapse. *Journal of Clinical Psychiatry*, 74(3), 233-239. doi: 10.4088/JCP.12m07657
- Fineberg, N. A., Apergis-Schoute, A. M., Vaghi, M. M., Banca, P., Gillan, C. M., Voon, V., et al. (2018). Mapping Compulsivity in the DSM-5 Obsessive Compulsive and Related Disorders: Cognitive Domains, Neural Circuitry, and Treatment. *International Journal of Neuropsychopharmacology*, 21(1), 42-58. doi: 10.1093/ijnp/pyx088
- Fineberg, N. A., Day, G. A., de Koenigswarter, N., Reghunandanan, S., Kolli, S., Jefferies-Sewell, K., et al. (2015). The neuropsychology of obsessive-compulsive personality disorder: a new analysis. *CNS SPECTRUMS*, 20(5), 490-499. doi: 10.1017/S1092852914000662
- Fineberg, N. A., Reghunandanan, S., Kolli, S., & Atmaca, M. (2014). Obsessive-compulsive (anankastic) personality disorder: toward the ICD-11 classification. *Revista Brasileira de Psiquiatria*, 36(suppl 1), S40-S50. doi: 10.1590/1516-4446-2013-1282

- Fineberg, N. A., Sharma, P., Sivakumaran, T., Sahakian, B., Chamberlain, S. R. (2007). Does obsessive-compulsive personality disorder belong within the obsessive-compulsive spectrum? *CNS spectrums*, 12(6): 467-482.
- Fitzgerald, M. (2002). Misdiagnosis of Asperger syndrome as anankastic personality disorder. *Autism*, 6(4), 435-435.
- Garyfallos, G., Katsigiannopoulos, K., Adamopoulou, A., Papazisis, G., Karastergiou, A., & Bozikas, V. P. (2010). Comorbidity of obsessive-compulsive disorder with obsessive-compulsive personality disorder: Does it imply a specific subtype of obsessive-compulsive disorder? *Psychiatry Research*, 177(1), 156-160. doi: 10.1016/j.psychres.2010.01.006
- Gillberg, C., & Rastam, M. (1992). Do Some Cases of Anorexia Nervosa Reflect Underlying Autistic-Like Conditions? *Behavioural Neurology*, 5(1), 27-32. doi: 10.3233/BEN-1992-5105
- Gillberg, C., & Billstedt, E. (2000). Autism and Asperger syndrome: coexistence with other clinical disorders. *Acta Psychiatrica Scandinavica*, 102: 321–30.
- Gjerde, L. C., Czajkowski, N., Roysamb, E., Ystrom, E., Tambs, K., Aggen, S. H., et al. (2015). A longitudinal, population-based twin study of avoidant and obsessive-compulsive personality disorder traits from early to middle adulthood. *Psychological Medicine*, 45(16), 3539-3548. doi: 10.1017/S0033291715001440
- Goodman, W. K., Price, L. H., Rasmussen, S. A., Mazure, C., Delgado, P., Heninger, G. R., Charney, D. S. (1989a). The Yale-Brown obsessive compulsive scale: II. Validity. *Arch Gener Psychiatry*, 46:1012–1016.
- Goodman, W. K., Price, L. H., Rasmussen, S. A., Mazure, C., Fleischmann, R. L., Hill, C. L., Heninger, G. R., Charney, D. S. (1989b). The Yale-Brown obsessive compulsive scale: I. Development, use, and reliability. *Arch Gener Psychiatry*, 46:1006–1011.
- Gordon, O. M., Salkovskis, P. M., Oldfield, V. B., & Carter, N. (2013). The association between obsessive compulsive disorder and obsessive compulsive personality disorder: Prevalence and clinical presentation. *British Journal of Clinical Psychology*, 52(3), 300-315. doi: 10.1111/bjcp.12016
- Grant, B. F., Hasin, D. S., Stinson, F. S., Dawson, D. A., Chou, S. P., Ruan, W. J., et al. (2004). Prevalence, correlates, and disability of personality disorders in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry*, 65(7), 948-958. doi: 10.4088/JCP.v65n0711
- Griffiths, D. L., Farrell, L. J., Waters, A. M., & White, S. W. (2017). Clinical correlates of obsessive-compulsive disorder and comorbid autism spectrum disorder in youth. *Journal of Obsessive-Compulsive and Related Disorders*, 14, 90-98. doi: 10.1016/j.jocrd.2017.06.006
- Grilo, C. M., Stout, R. L., Markowitz, J. C., Sanislow, C. A., Ansell, E. B., Skodol, A. E., et al. (2010). Personality Disorders Predict Relapse After Remission From an Episode of Major Depressive Disorder: A 6-Year Prospective Study. *Journal of Clinical Psychiatry*, 71(12), 1629-1635. doi: 10.4088/JCP.08m04200gre
- Halmi, K. A., Tozzi, F., Thornton, L. M., Crow, S., Fichter, M. M., Kaplan, A. S., et al. (2005). The relation among perfectionism, obsessive-compulsive personality disorder and obsessive-compulsive disorder in individuals with eating disorders. *International Journal of Eating Disorders*, 38(4), 371-374. doi: 10.1002/eat.20190
- Hofvander, B., Delorme, R., Chaste, P., Nyden, A., Wentz, E., Stahlberg, O., et al. (2009). Psychiatric and psychosocial problems in adults with normal-intelligence autism spectrum disorders. *BMC Psychiatry*, 9(1), 35-35. doi: 10.1186/1471-244X-9-35
- Hollander, E., King, A., Delaney, K., Smith, C. J., & Silverman, J. M. (2003). Obsessive-compulsive behaviors in parents of multiplex autism families. *Psychiatry Research*, 117(1), 11-16. doi: 10.1016/S0165-1781(02)00304-9
- Hrdlicka, M., & Dudova, I. (2013). Controversies in autism: is a broader model of social disorders needed? *Child and Adolescent Psychiatry and Mental Health*, 7(1), 9-9. doi: 10.1186/1753-2000-7-9

- Hummelen, B., Wilberg, T., Pedersen, G., & Karterud, S. (2008). The Quality of the DSM-IV Obsessive-Compulsive Personality Disorder Construct as a Prototype Category. *The Journal of Nervous and Mental Disease*, 196(6), 446-455. doi: 10.1097/NMD.0b013e3181775a4e
- Jefferies-Sewell, K., Chamberlain, S. R., Fineberg, N. A., & Laws, K. R. (2017). Cognitive dysfunction in body dysmorphic disorder: new implications for nosological systems and neurobiological models. *CNS spectrums*, 22(1), 51-60. doi: 10.1017/S1092852916000468
- Lochner, C., Serebro, P., der Merwe, L. v., Hemmings, S., Kinnear, C., Seedat, S., et al. (2011). Comorbid obsessive-compulsive personality disorder in obsessive-compulsive disorder (OCD): A marker of severity. *Progress in Neuropsychopharmacology & Biological Psychiatry*, 35(4), 1087-1092. doi: 10.1016/j.pnpbp.2011.03.006
- Lugnegård, T., Hallerbäck, M. U., Gillberg, C., Gillberg Neuropsychiatry, C., Sahlgrenska, a., Göteborgs, u., et al. (2012). Personality disorders and autism spectrum disorders: what are the connections? *Comprehensive Psychiatry*, 53(4), 333-340. doi: 10.1016/j.comppsych.2011.05.014
- Mancebo, M. C., Eisen, J. L., Grant, J. E., & Rasmussen, S. A. (2005). Obsessive compulsive personality disorder and obsessive compulsive disorder: clinical characteristics, diagnostic difficulties, and treatment. *Annals of clinical psychiatry : official journal of the American Academy of Clinical Psychiatrists*, 17(4), 197-204. doi: 10.1080/10401230500295305
- McGlashan, T. H., Grilo, C. M., Sanislow, C. A., Ralevski, E., Morey, L. C., Gunderson, J. G., et al. (2005). Two-Year Prevalence and Stability of Individual DSM-IV Criteria for Schizotypal, Borderline, Avoidant, and Obsessive-Compulsive Personality Disorders: Toward a Hybrid Model of Axis II Disorders. *American Journal of Psychiatry*, 162(5), 883-889. doi: 10.1176/appi.ajp.162.5.883
- Morein-Zamir, S., Papmeyer, M., Pertusa, A., Chamberlain, S. R., Fineberg, N. A., Sahakian, B. J., et al. (2013). The profile of executive function in OCD hoarders and hoarding disorder. *Psychiatry Research*, 215(3), 659-667. doi: 10.1016/j.psychres.2013.12.026
- National Collaborating Centre for Mental Health. (UK 2012). The NICE Guideline on Recognition, Referral, Diagnosis and Management of Adults on the Autism Spectrum. Leicester and London: The British Psychological Society and The Royal College of Psychiatrists. UK.
- Nestadt, G., Samuels, J., Riddle, M., Bienvenu, O. J., Liang, K.-Y., LaBuda, M., et al. (2000). A Family Study of Obsessive-compulsive Disorder. *Archives of General Psychiatry*, 57(4), 358-363. doi: 10.1001/archpsyc.57.4.358
- Nilsson, E. W., Gillberg, C., Gillberg, I. C., RÅStam, M., Sahlgrenska, a., Institute for the Health of, W., et al. (1999). Ten-Year Follow-up of Adolescent-Onset Anorexia Nervosa: Personality Disorders. *Journal of the American Academy of Child & Adolescent Psychiatry*, 38(11), 1389-1395. doi: 10.1097/00004583-199911000-00013
- Özyurt, G., & Beşiroğlu, L. (2018). Autism Spectrum Symptoms in Children and Adolescents with Obsessive Compulsive Disorder and Their Mothers. *Noro psikiyatri arşivi*, 55(1), 40-48. doi: 10.29399/hpa.18138
- Pena-Garijo, J., Villamon, S. E., de Alba, A. M., & Ruiperez, M. A. (2013). Personality Disorders in Obsessive-Compulsive Disorder: A Comparative Study versus Other Anxiety Disorders. *Scientific World Journal*, 2013, 856846-856847. doi: 10.1155/2013/856846
- Phillips, K. A., Pinto, A., Hart, A. S., Coles, M. E., Eisen, J. L., Menard, W., et al. (2012). A comparison of insight in body dysmorphic disorder and obsessive-compulsive disorder. *Journal of Psychiatric Research*, 46(10), 1293-1299. doi: 10.1016/j.jpsychires.2012.05.016
- Pinto, A., Liebowitz, M. R., Foa, E. B., & Simpson, H. B. (2011). Obsessive compulsive personality disorder as a predictor of exposure and ritual prevention outcome for obsessive compulsive disorder. *Behaviour Research and Therapy*, 49(8), 453-458. doi: 10.1016/j.brat.2011.04.004
- Pinto, A., Mancebo, M. C., Eisen, J. L., Pagano, M. E., & Rasmussen, S. A. (2006). The Brown longitudinal obsessive compulsive study: Clinical features and symptoms of the sample at intake. *Journal of clinical Psychiatry*, 67(5), 703-711. doi: 10.4088/JCP.v67n0503

- Rapp, A. M., Bergman, R. L., Piacentini, J., & McGuire, J. F. (2016). Evidence-Based Assessment of Obsessive-Compulsive Disorder. *Journal of Central Nervous System Disease*, 2016(8), 13. doi: 10.4137/JCNSD.S38359
- Reddy, M. S., Maitri, S. V. (2015). Obsessive Compulsive Personality Disorder—A Case Report. *Complicated Cases in Obsessive Compulsive Disorder*, 4: 1-5.
- Reddy, M. S., Vijay, M. S., & Reddy, S. (2016). Obsessive-compulsive (Anankastic) Personality Disorder: A Poorly Researched Landscape with Significant Clinical Relevance. *Indian Journal of Psychological Medicine*, 38(1): 1–5.
- Reghunandanan, S., Fineberg, N. A., & Stein, D. S. (2015). *Obsessive Compulsive Disorder* (2nd ed.). Oxford: Oxford University Press.UK.
- Reghunandanan, S., & Fineberg, N. A. (2012). Methodological issues for clinical treatment trials in obsessive compulsive disorder. In J. Zohar (Ed.). *Obsessive Compulsive Disorder: Current Science and Clinical Practice*. (pp. 193-220). Wiley-Blackwell ISBN: 978-0-470-71125-5
- Samuel, D. B., & Widiger, T. A. (2010). A Comparison of Obsessive-Compulsive Personality Disorder Scales. *Journal of Personality Assessment*, 92(3), 232-240. doi: 10.1080/00223891003670182
- Samuels, J., Nestadt, G., Bienvenu, O. J., Costa, P. T., Jr., Riddle, M. A., Liang, K.-Y., et al. (2000). Personality disorders and normal personality dimensions in obsessive-compulsive disorder. *The British Journal of Psychiatry*, 177(5), 457-462. doi: 10.1192/bjp.177.5.457
- Sanislow, C. A., Grilo, C. M., Morey, L. C., Bender, D. S., Skodol, A. E., Gunderson, J. G., et al. (2002). Confirmatory Factor Analysis of DSM-IV Criteria for Borderline Personality Disorder: Findings From the Collaborative Longitudinal Personality Disorders Study. *American Journal of Psychiatry*, 159(2), 284-290. doi: 10.1176/appi.ajp.159.2.284
- Sansone, R. A., Hendricks, C. M., Gaither, G. A., & Reddington, A. (2004). Prevalence of anxiety symptoms among a sample of outpatients in an internal medicine clinic: A pilot study. *Depression and Anxiety*, 19(2), 133-136. doi: 10.1002/da.10143
- Sansone, R. A., Hendricks, C. M., Sellbom, M., & Reddington, A. (2003). Anxiety Symptoms and Healthcare Utilization among a Sample of Outpatients in an Internal Medicine Clinic. *The International Journal of Psychiatry in Medicine*, 33(2), 133-139. doi: 10.2190/EYJ9-UVF4-RGP8-WK88
- Serpell, L., Livingstone, A., Neiderman, M., & Lask, B. (2002). Anorexia nervosa: Obsessive-compulsive disorder, obsessive-compulsive personality disorder, or neither? *Clinical Psychology Review*, 22(5), 647-669. doi: 10.1016/S0272-7358(01)00112-X
- Starcevic, V., Berle, D., Brakoulias, V., Sammut, P., Moses, K., Milicevic, D., et al. (2013). Obsessive-compulsive personality disorder co-occurring with obsessive-compulsive disorder: Conceptual and clinical implications. *Australian & New Zealand Journal of Psychiatry*, 47(1), 65-73. doi: 10.1177/0004867412450645
- Starcevic, V., & Brakoulias, V. (2018). The importance of aberrant beliefs in obsessive-compulsive disorder and related conditions. *Australian & New Zealand Journal of Psychiatry*, 52(2), 201-202. doi: 10.1177/0004867417726178
- Toh, W. L., Castle, D. J., Mountjoy, R. L., Buchanan, B., Farhall, J., & Rossell, S. L. (2017). Insight in Body Dysmorphic Disorder (BDD) Relative to Obsessive-Compulsive Disorder (OCD) and Psychotic Disorders: Revisiting this Issue in Light of DSM-5. *Comprehensive Psychiatry*, 77, 100-108. doi: 10.1016/j.comppsych.2017.06.004
- Torgersen, S., Lygren, S., Øien, P. A., Skre, I., Onstad, S., Edvardsen, J., et al. (2000). A twin study of personality disorders. *Comprehensive Psychiatry*, 41(6), 416-425. doi: 10.1053/comp.2000.16560
- Villemarette-Pittman, N. R., Stanford, M. S., Greve, K. W., Houston, R. J., & Mathias, C. W. (2004). Obsessive-Compulsive Personality Disorder and Behavioral Disinhibition. *The Journal of Psychology*, 138(1), 5-22. doi: 10.3200/JRLP.138.1.5-22
- Wewetzer, C., Jans, T., Müller, B., Neudörfl, A., Bücherl, U., Remschmidt, H., et al. (2001). Long-term outcome and prognosis of obsessive-compulsive disorder with onset in childhood or

- adolescence. *European Child & Adolescent Psychiatry*, 10(1), 37-46. doi: 10.1007/s007870170045
- Wikramanayake, W. N. M., Mandy, W., Shahper, S., Kaur, S., Kolli, S., Osman, S., et al. (2018). Autism spectrum disorders in adult outpatients with obsessive compulsive disorder in the UK. *International Journal of Psychiatry in Clinical Practice*, 22(1), 54-62. doi: 10.1080/13651501.2017.1354029
- Woodbury-Smith, M. R., Robinson, J., Wheelwright, S., & Baron-Cohen, S. (2005). Screening Adults for Asperger Syndrome Using the AQ: A Preliminary Study of its Diagnostic Validity in Clinical Practice. *Journal of Autism and Developmental Disorders*, 35(3), 331-335. doi: 10.1007/s10803-005-3300-7
- Woody, S. R., Steketee, G., & Chambless, D. L. (1995). Reliability and validity of the Yale-Brown Obsessive-Compulsive Scale. *Behaviour Research and Therapy*, 33(5), 597-605. doi: 10.1016/0005-7967(94)00076-V
- Young, S., Rhodes, P., Touyz, S., & Hay, P. (2013). The relationship between obsessive-compulsive personality disorder traits, obsessive-compulsive disorder and excessive exercise in patients with anorexia nervosa: a systematic review. *Journal of eating disorders*, 1(1), 16. doi: 10.1186/2050-2974-1-16
- Zimmerman, M., Rothschild, L., & Chelminski, I. (2005). The Prevalence of DSM-IV Personality Disorders in Psychiatric Outpatients. *American Journal of Psychiatry*, 162(10), 1911-1918. doi: 10.1176/appi.ajp.162.10.1911
- Zucker, N. L., & Losh, M. (2008). Repetitive behaviours in anorexia nervosa, autism, and obsessive-compulsive personality disorder. *Psychiatry*, 7(4), 183-187. doi: 10.1016/j.mppsy.2008.02.012

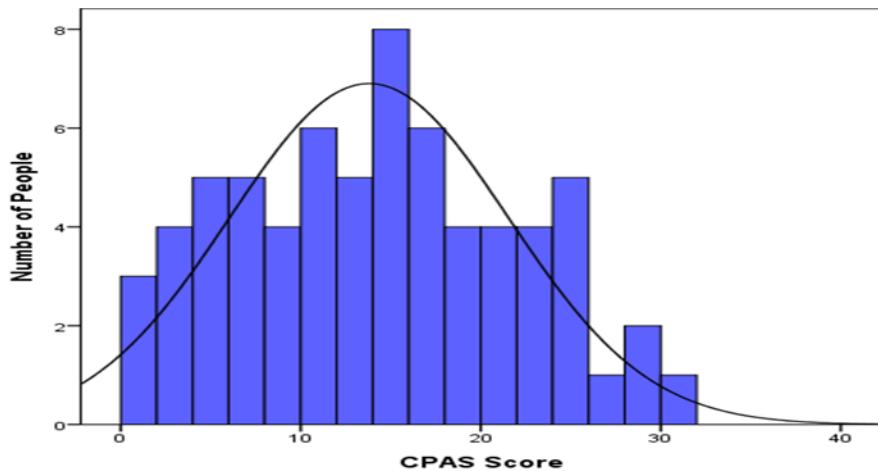


Figure 1. Distribution of OCPD traits in the total OCD sample, measured as scores on the Compulsive Personality Assessment Scale (CPAS).

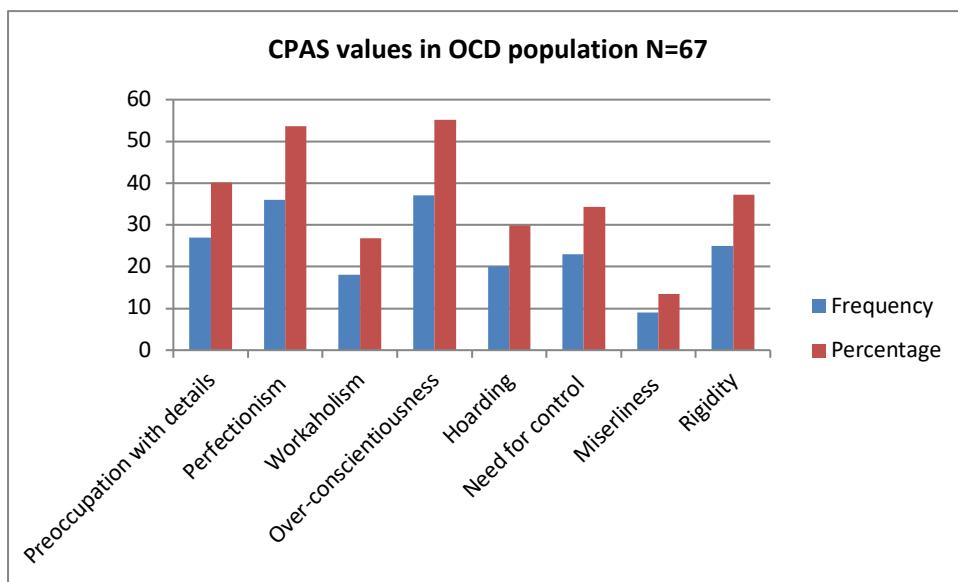


Figure 2. Distribution of OCPD domains within the OCD sample, measured using the Compulsive Personality Assessment Scale (CPAS)

Table 1. OCD with or without OCPD: Demographic and clinical variables

	OCPD + n = 24 Mean (SD)	OCPD - n = 43 Mean (SD)	Effect size Cohens d {95% CIs} or [X ²]	P
Gender (M:F)	10:14	22:21	[.56]	.46
*Employed: Unemployed	6:17	21:19	[4.1]	.04
Age in years	45.67(11.076)	44.25 (12.15)	.11 {-0.38, 0.62}	.39
Age of OCD Onset	13.75 (7.64)	14.55 (8.76)	-.10 {-0.60, 0.40}	.50
Age OCD diagnosed	28 (9.72)	27.72 (11.79)	.03 {-0.47, 0.52}	.80
CPAS	22.55 (3.79)	9.51 (5.10)	2.76 {2.06, 3.45}	.00
*Y-BOCS Total	21.29 (6.64)	18.85 (8.51)	.31 {-0.19, 0.81}	.23
*Y-BOCS Obsessions	10.21 (4.09)	9.45 (4.06)	.18 {-0.32, 0.69}	.47
*Y-BOCS Compulsions	11.08 (3.45)	10.23 (4.91)	.19 {-0.31, 0.70}	.46
AQ total	28.04 (7.15)	22.10 (7.92)	.78 {0.29, 1.30}	.003
BABS	6.83 (5.81)	5.93 (4.99)	.17 {-0.33, 0.67}	.51

* Some individual's data missing

Significance is reported to 2 decimal places; significant values are depicted in bold type.

Table 2. OCD domains in the presence or absence of OCPD.

Y- BOCS Checklist domain	OCD + OCPD (n = 24) 35.8%	OCD – OCPD (n = 43) 64.2%	X ² (p value)
Obsessions			
Aggression	12	26	.32 (.57)
Contamination	15	29	.005 (.94)
Sexual	3	10	.51 (.34)
Hoarding	12	12	4.16 (.04)
Religious	3	12	0.23 (.18)
Symmetry	9	15	.23 (.63)
Miscellaneous	16	23	2.24 (.13)
Somatic	7	17	.37 (.54)
Compulsions			
Cleaning	16	28	.39 (.54)
Checking	16	30	.06 (.80)
Repeating	16	23	2.24 (.13)
Counting	13	18	1.73 (.19)
Ordering	11	13	2.44 (.12)
Hoarding	10	10	2.93 (.087)

Significant values (P ≤ .05) are denoted in bold

Table 3. OCPD Domains in the Presence or Absence of ASD.

The presence of each OCPD domain was defined by a score of 3 or more on the CPAS.

OCPD Domain	ASD (n=19) 28.3%	No ASD (n=48) 71.6%	X ² (p value)
Preoccupation with details	12	16	4.97 (.03)
Perfectionism	14	22	4.25 (.04)
Workaholism	10	8	8.96 <.01)
Over-conscientiousness	15	22	6.03 (.01)
Hoarding	8	12	1.90 (.17)
Need for control	12	12	8.62 <.01)
Miserliness	4	5	1.32 (.25)
Rigidity	11	16	3.41 (.07)

Significant values (P ≤ .05) are denoted in bold.