

## Suicidality in patients with obsessive-compulsive and related disorders (OCRDs): A meta-analysis



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### ABSTRACT

**Introduction:** Previous meta-analyses showed that OCD is associated with a substantial risk of suicidal behaviours. Conclusive rates of suicidal ideation (current and lifetime) and suicide attempts based on pooled prevalence rates have not so far been calculated using meta-analysis for the other DSM-5 Obsessive-Compulsive and Related Disorders (OCRDs).

**Objectives:** This meta-analysis aims to separately calculate the pooled prevalence rates of lifetime suicide attempts and current or lifetime suicidal ideation in BDD, Hoarding Disorder (HD), Skin Picking Disorder (SPD) and Trichotillomania (TTM) and to identify factors associated with increased suicide rates.

**Methods:** Our protocol was pre-registered with PROSPERO (CRD42020164395). A systematic review and meta-analysis following PRISMA reporting guidelines was performed by searching in PubMed/Medline, PsycINFO, Web of Science and CINAHL databases from the date of the first available article to April 20th, 2020. Stata version 15 was used for the statistical analysis. Given the small number of studies in TTM and SPD, the two grooming disorders were grouped together. Meta-analyses of proportions based on random effects (Der-Simonian and Laird method) were used to derive the pooled estimates.

**Results:** Thirty-eight studies ( $N = 4559$  participants) were included: 23 for BDD, 8 for HD, 7 for Grooming Disorders. For BDD, the pooled prevalence of lifetime suicide attempts, current and lifetime suicidal ideation was, respectively 35.2% (CI:23.4–47.8), 37.2% (CI:23.8–51.6) and 66.1% (CI:53.5–77.7). For HD, the pooled prevalence of lifetime suicide attempts, current and lifetime suicidal ideation was 24.1% (CI:12.8–37.6), 18.4% (CI:10.2–28.3) and 38.3% (CI:35.0–41.6), respectively. For Grooming Disorders, the pooled prevalence of lifetime suicide attempts and current suicidal ideation were 13.3% (CI:5.9–22.8) and 40.4% (CI:35.7–45.3), respectively (no data available for lifetime suicidal ideation).

**Conclusions:** The OCRDs as a group are associated with relatively high rates of suicidal behaviour. Through indirect comparisons, we infer that BDD has the greatest risk. Comorbid substance abuse, possibly reflecting poor underlying impulse control, is associated with higher rates of suicidal behaviour in BDD. Our data emphasize the need for clinicians to consider the risk of suicidal behaviour in the management of patients presenting with all forms of OCRDs.

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### 1. Introduction

Obsessive-Compulsive Disorder (OCD) is a common, chronic and relatively treatment resistant neuropsychiatric disorder [3]. OCD is the

nosological organizer of an emerging family or spectrum of disorders, named in the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) chapter as Obsessive Compulsive and Related Disorders (OCRDs). These other disorders are: Body Dysmorphic Disorder (BDD), Hoarding Disorder (HD), Skin Picking Disorder (SPD) and Trichotillomania (TTM). They are defined by the presence of obsessions and/or compulsions, alongside shared psychopathological and neurobiological features and are characterized by compulsive, impulsive and habitual behaviours [4]. Indeed, whereas all the disorders included in

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this chapter share similarities with OCD, some such as BDD and HD appear, phenotypically, to have a stronger cognitive and affective component – and thus appear closer to OCD – while others such as TTM and SPD are predominantly characterized by body-focused repetitive behaviours suggesting a stronger impulsive or habitual motor component [5].

OCRDs often start in childhood and follow a fluctuating lifelong course. They have an extensive impact on the quality of life, well-being and global functioning of affected individuals and their family members [6,7]. Both OCD and BDD have been found to be associated with a relatively long delay in help seeking (up to 11 years for OCD) [8,9], with OCD having a duration of untreated illness (DUI) recently estimated at 7 to 9 years, i.e. one of the longest among psychiatric disorders [10–12]. The chronicity, delay in help-seeking and long duration of untreated illness is thought to contribute to the development of secondary psychiatric conditions such as depression [13]. Indeed, secondary depression in OCD develops in roughly 60% of cases and correlates with duration of illness [13], thereby potentially increasing suicide risk.

Suicide is a major preventable cause of premature death worldwide, and research on factors associated with suicidal ideation and behaviour in individuals with mental disorders is imperative. Suicidal ideation is defined as the presence of passive thoughts about wanting to be dead or active thoughts about killing oneself, not accompanied by preparatory behaviour [14]; suicide attempts are recognized as nonfatal self-directed potentially injurious behaviours with any intent to die as a result of the behaviour [15].

OCRDs were historically thought not to be related to an elevated suicide risk [16–18]. Recent systematic reviews and meta-analyses, however, have challenged this assumption and suggested that individuals with OCD are at a substantially higher risk of suicide attempts and suicidal ideation than the general population [1,19–24,110]. Accurate pooled rates of suicide attempts and suicidal ideation in individuals with a primary diagnosis of OCD were identified by a recent meta-analysis from our research group [1]: the pooled prevalence of current suicidal ideation was 27.3% (95%CI: 21.4–33.5%), the pooled prevalence of lifetime suicidal ideation was 47.3% (95%CI: 39.7–54.8%), and the pooled prevalence of lifetime suicide attempts was 13.5% (95%CI: 12.3–14.7%). Suicide attempts rates were positively associated with increase in severity of obsessions, proportion of comorbid substance use and severity of depressive/anxious symptoms, whereas suicide attempts rate decreased as severity of compulsions increased. In contrast, suicidal ideation rate was positively associated with severity of obsessions, lower education, higher unemployment rates, lifetime alcohol use disorders, personality disorders and family history of completed suicide [1]. Interestingly, whereas a lifetime diagnosis of comorbid Anxiety Disorder was associated with lower rates of suicidal ideation, the severity of comorbid anxiety symptoms was positively related to suicidal ideation prevalence [1]. The authors concluded that these factors should be used to inform a suicidal risk assessment that should be factored into the assessment of all cases of OCD.

Less is known about suicidality and other OCRDs included in the DSM-5. Only one previous meta-analysis examined the strength and patterns of the association between suicidality and BDD, concluding that BDD is associated with increased odds for both suicide attempts and suicidal ideation [2], with a positive and statistically significant association found between BDD and suicidality (OR: 3.63, 95% CI: 2.62 to 4.63). However, in this meta-analysis suicide attempts and suicidal ideation were investigated together. This approach is not ideal, as suicidal thoughts and acts may be mediated by different mechanisms (neural, psychological, behavioural) and, as described above, may be linked to different risk factors. Moreover, it is important to investigate the history of suicide attempts separately, as this factor usually constitutes the strongest predictor of completed suicide [25]. The meta-analysis by Angelakis and colleagues [2] had another limitation: the authors did not separate current and lifetime suicidal ideation when estimating the effect size of the association between suicidal ideation and OCD.

Moreover, since this meta-analysis was published, much new data has emerged concerning the prevalence of suicide attempts and suicidal ideation and factors associated with increased risk in BDD. No similar studies are available for the other disorders of the OCRDs chapter.

Given the relatively high prevalence of OCRDs in the general population, estimated in one analysis to account for around 10% [26], and the impact in terms of psychosocial impairment associated with these disorders, the investigation of suicidality and the identification of potential socio-demographic and clinical factors that could increase the risk for suicide is of considerable clinical relevance.

The association between suicidality and OCRDs was the focus of a systematic review our research group recently published [24]. This previous work raised interest in the topic of suicidality in OCRDs as a group but did not include a quantitative meta-analysis. A subsequent meta-analysis was performed by the same authorship group, which investigated OCD only [1]. In the current paper, we extend a similar quantitative statistical approach to the investigation of the remaining DSM-5 OCRDs based on a comprehensive analysis of all the relevant published literature, including the results from a few papers published after 2018.

The primary aim of the present systematic review and meta-analysis was to estimate the pooled prevalence of lifetime suicide attempts, current suicidal ideation and lifetime suicidal ideation in individuals with a primary diagnosis of Obsessive-Compulsive Related Disorders (excluding OCD). Our second aim was to identify, when possible, with meta-regression and subgroup analyses, which study characteristics or socio-demographic and clinical factors explain the variability in prevalence rates.

## 2. Materials and methods

The protocol for this systematic review and meta-analysis was pre-registered with PROSPERO (CRD42020164395). The work was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement (PRISMA) [27].

### 2.1. Search strategy

We conducted a literature search in PubMed/Medline, PsycINFO, Web of Science and CINAHL databases from the date of the first available article (1993) to April 30th, 2020. The following search terms were used: (suicide OR suicidality OR suicide attempts OR suicidal ideation OR suicidal thoughts) AND ((BDD OR body dysmorphic disorder) OR (HD OR hoarding disorder) OR (trichotillomania OR hair pulling disorder) OR (excoriation disorder OR skin picking disorder)).

### 2.2. Article selection and review strategy

Articles were identified and assessed for eligibility by two reviewers (UA and LP), who independently decided which articles to include according to eligibility criteria (see below). In case of disagreement, a third author (GM) was consulted to reach consensual decisions. Duplicate studies were excluded. Cross-references from the articles identified were also examined. Unpublished studies, conference abstracts or poster presentations were not included. The database search was restricted to English language papers.

### 2.3. Eligibility criteria

The inclusion criteria for the studies were the following: 1) An appropriate case definition of OCRDs (diagnosis made through structured clinical interviews and/or standardized international criteria); 2) Children/adolescents and/or adults; 3) Cross-sectional or prospective in design; 4) Performed in clinical samples or in the general population (epidemiological studies); 5) Employed a quantitative measure of suicidality in order to derive prevalence rates of lifetime suicide attempts, current or lifetime suicidal ideation. We excluded studies

performed in individuals with a primary diagnosis other than OCRDs (e.g., individuals with Bipolar Disorder or Schizophrenia) even when they assessed the impact of obsessive-compulsive symptoms on suicidality.

#### 2.4. Data extraction and imputation

Two authors (LP and UA) independently extracted the following variables (identified based on previous literature [22,23], and pre-registered on Prospero) from appropriate studies when available: date of publication, country, geographic area (North America, South America, Europe, Asia and Africa), study design (cross-sectional, longitudinal), population type (clinical, general), total sample size, gender distribution, mean age, age group (adults, children/adolescents, mixed), percentage married, years of education, percentage unemployed, diagnostic criteria for OCRDs, method used to diagnose OCRDs (clinical interview, semi-structured interview such as SCID-I [28,29], or MINI [30]), age at symptoms onset, age at disorder onset, duration of illness (years), severity of symptoms (e.g., Yale-Brown Obsessive-Compulsive Scale Modified for Body Dysmorphic Disorder (BDD-YBOCS) [31], Saving Inventory Revise (SIR) [32], percentage with childhood trauma, percentage with Axis I comorbidities (current and lifetime separately), percentage with mood disorders, Major Depressive Disorder, Bipolar Disorder, Anxiety Disorders, Substance Use Disorders, Alcohol Use Disorder (current and lifetime), percentage with Axis II comorbidities/Personality Disorders, severity of depressive symptoms (measured with the Hamilton Depression Rating Scale (HDRS) [33], Montgomery-Asberg Depression Rating Scale (MADRS) [34], or Beck Depression Inventory (BDI) [35]), severity of anxiety symptoms (measured with the Hamilton Anxiety Rating Scale (HARS) [36] and Beck Anxiety Inventory (BAI) [37]), hopelessness (Beck Hopelessness Scale (BHS) [38]), screening tool for suicidality, family history for suicide attempts and for completed suicide.

#### 2.5. Appraisal of methodological quality

The methodological quality of the studies was assessed by two independent raters (LP and UA) using a modified version of the Quality Assessment Tool (QAT) for Observational Cohort and Cross-Sectional Studies (<https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools>). The tool consists of 14 items that address specific methodological issues. We excluded five items that did not fit with the nature of most studies here considered: item 5 (sample selection procedures), item 6 (exposure assessed prior to outcome measurement), item 10 (repeated measurement of the exposure), item 12 (blinded outcome measurement) and item 13 (follow-up loss rates). For each item satisfied, a point was assigned (yes = 1; item not satisfied or for which no sufficient information was available = 0). A sum score ranging from 0 to 9 was then calculated.

#### 2.6. Statistical analyses

A systematic analytical approach was used to compute the pooled prevalence rates of lifetime suicide attempts, current suicidal ideation and past suicidal ideation from all eligible studies separately for each disorder group. In the case of SPD and TTM, as the number of studies was too small to be investigated in separate analyses (respectively  $N = 4$  for SPD,  $N = 3$  for TTM and  $N = 1$  for SPD + TTM considered altogether), these two disorders were analysed together as Grooming Disorders. The Stata command `metaprop` was used to perform meta-analyses of proportions, to derive pooled estimates, to obtain exact binomial confidence intervals and to produce forest plots. The pooled estimates were calculated after Freeman-Tukey Double Arcsine Transformation [39] to stabilize the variances. A random-effects model was selected to summarize the prevalence of lifetime suicide attempt,

current suicidal ideation and past suicidal ideation, using proportions and 95% confidence intervals (CIs).

The pooled prevalence rates and their 95% CIs were compared between disorder groups and used to detect any significant difference. Heterogeneity among studies was assessed using Cochran's Q test and the  $I^2$  statistic.  $I^2 > 50\%$  was considered to denote substantial heterogeneity and in such cases the sources of heterogeneity were explored. Subgroup analyses by type of population (general, clinical), age group (adults, adolescents, mixed) and geographical area were performed to investigate heterogeneity. In addition, the effect of continuous covariates was tested by univariate random meta-regression based on the Der Simonian and Laird (1986) [40] method. We used the method of moments to estimate the additive (between-study) component of variance  $\tau^2$ . Meta-regressions were performed when a covariate was available for at least four studies. Publication bias was assessed in meta-analyses with  $\geq 8$  studies by means of funnel plots and Egger's test. Sensitivity analyses were carried out in order to assess the robustness of our findings. A primary sensitivity analysis included studies with medium-high quality (QAT score  $\geq 7$ ); in a secondary sensitivity analysis, the leave-one-out approach was used to evaluate the influence of each study on the pooled prevalence. The significance level was set at  $p < 0.05$ . All statistical analyses were performed using Stata version 15 (StataCorp, 2017. *Stata Statistical Software: Release 15*. College Station, TX) [41].

### 3. Results

The PRISMA flowchart of studies selected and included in the systematic review and meta-analysis is provided in Fig. 1. The search strategy yielded 1498 articles, 95 of which were eligible for full-text screening. As shown in the flowchart (Fig. 1), 38 studies with independent samples were included in the final quantitative analysis. We excluded 20 articles as they were based on the same sample of participants (see Appendix 1).

Completed suicide rates were not included in the meta-analysis as there were not enough studies reporting data on completed suicide. Tables 1A, 1B and 1C summarize the characteristics of the 38 studies ( $N = 4559$  individuals), 23 for BDD, 8 for HD, 7 for GD, included in the meta-analysis.

The majority of studies were conducted in USA (16, 41.0%), Europe ( $N = 10$ , 28.2%), and Brazil ( $n = 7$ , 17.9%). The majority of studies included participants from clinical populations and only four were conducted in the general population; all had a cross-sectional design except two studies which had a longitudinal design [56,77]). Gender distribution was similar among studies (only one study [49] included exclusively females). The mean age of the study samples ranged between 13.7 [50] and 67 years [66], with three studies investigating specifically children/adolescent [41,50,52]. Most studies included only adults ( $\geq 18$  years of age).

The most widely used tools for assigning a diagnosis of OCRD was the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I). Suicidality was assessed using different instruments, only some of which were specifically designed to inquire about suicidality (e.g., Beck Suicide Intent Scale - SIS [81] in Alonso et al. (2010) [64]; Scale for Suicidal Ideation - SSI [82] in Balci & Sevincok (2010) [68]). Columbia Suicide Severity Rating Scale (C-SSRS) [83] in Snorrason et al. (2019) [61]. The study quality (assessed with the QAT modified) was relatively homogeneous, as shown in the Supplemental materials (see Tables 1A, 1B, 1C in Supplemental materials). None of the studies had a low quality in data reporting (QAT score  $\leq 3$ ), only 3 studies had a score of 4, while the majority ( $N = 21$ , 53.8%) had moderate-high quality (QAT score  $\geq 7$ ).

#### 3.1. Lifetime suicide attempts in OCRDs

The forest plot with all the studies investigating lifetime suicide attempts in OCRDs is shown in Fig. 2. In this forest plot, the updated pooled prevalence of attempts in OCD is also shown for comparison.

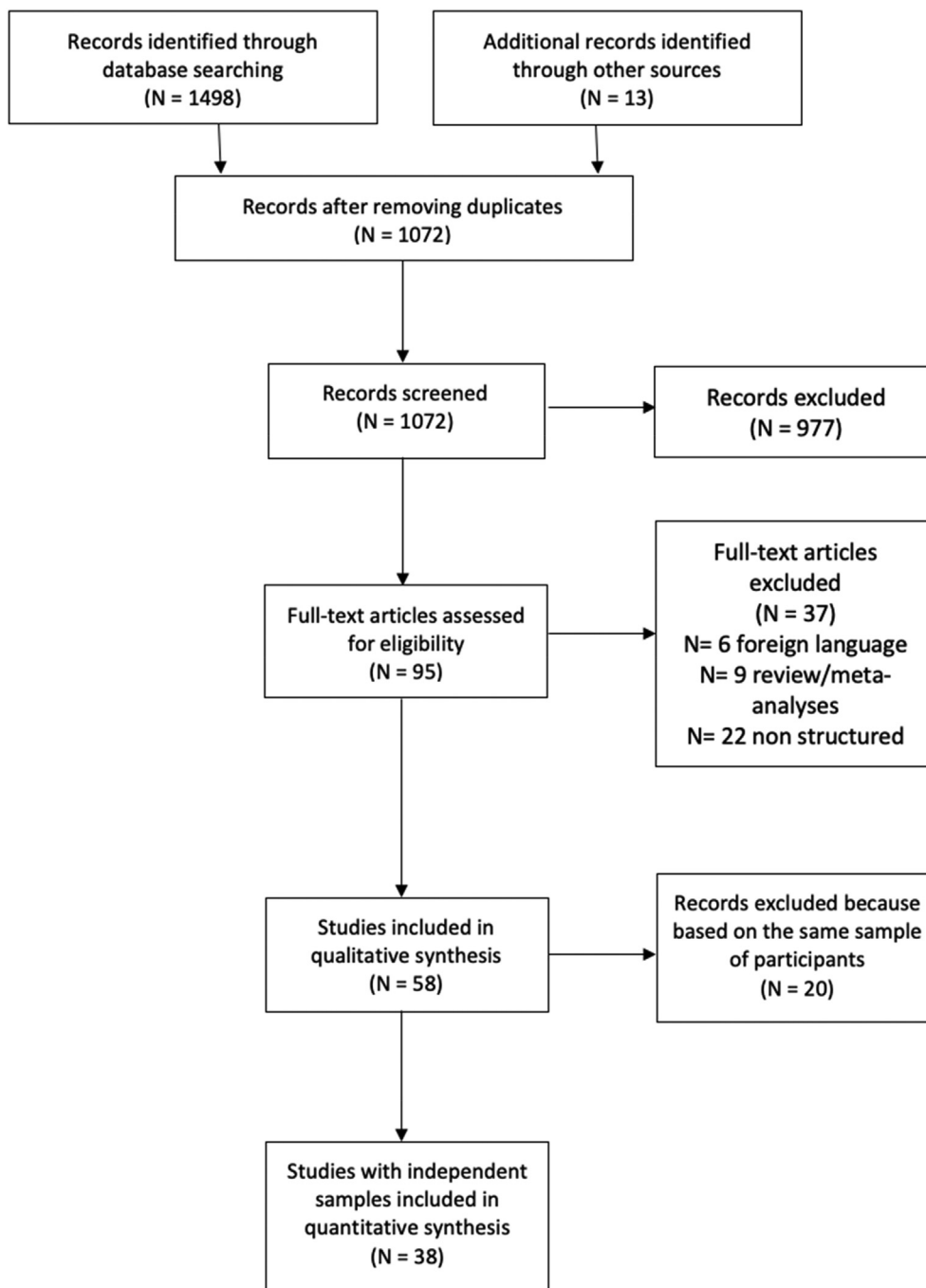


Fig. 1. Flow chart of the studies.

Twenty-eight studies investigated lifetime suicide attempts in OCD: 16 in BDD, 6 in HD and 6 in Grooming Disorders, with overall random-effects pooled rates of 35.2% (95%CI: 23.4–47.8%), 24.1% (95%CI: 12.8–36.7) and 13.3% (95%CI: 5.9–22.8%), respectively. Heterogeneity was high in all three disorders.

### 3.1.1. Lifetime suicide attempts in BDD

In BDD, the studies reported rates of lifetime suicide attempts ranging from 7% to 97%. The random-effect meta-analysis of lifetime suicide attempts rates revealed a large heterogeneity among studies,  $I^2 = 91.4\%$ , with 2 studies exceeding the upper boundary of the confidence

interval of the pooled estimate [46,60]. The funnel plot and Egger's test indicated the absence of publication bias (Supplemental Fig. 1).

In a sensitivity analysis including moderate-high quality studies ( $N = 11$ ) pooled prevalence and heterogeneity were similar to those of the primary analysis (pooled rate = 37.8%, 95%CI: 23.3–53.4%,  $I^2 = 93.4\%$ ) (Supplemental Fig. 2). When sensitivity analyses with the leave-one-out approach were conducted, excluding the study by Semiz et al. 2008 [60], the pooled prevalence dropped from 35% to 29%, with heterogeneity remaining high ( $I^2 = 83.3\%$ ) (Supplemental Fig. 3).

In subgroup analyses, we found significant differences in prevalence by type of population and geographical area. Studies in the general

**Table 1A**  
Suicidality in BDD – Descriptive characteristics of studies included in the meta-analysis ( $N = 23$ ).

Study	Country	Study design	Screening tool for DD	Screening tool for suicidality	Mode of suicidality	Target population	BDD sample size N	Men (%)	Age (years)
Albertini & Phillips (1999) [42]	USA	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), BDD Form, Yale-Brown Obsessive-Compulsive Scale Modified for Body Dysmorphic Disorder (BDD-YBOCS)	BDD Data Form	Suicide attempts & Lifetime suicidal ideation	Children and adolescents (aged 17 years or younger) with BDD	33	9.00	M = 14.9 (SD = 2.2) Range: 6–17
Altamura et al. (2001) [43]	Italy	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale-Brown Obsessive-Compulsive Scale Modified for Body Dysmorphic Disorder (BDD-YBOCS)	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)	Current suicidal ideation	Seeking plastic surgery/consultation	30	13.30	M = 25.8 (SD = 9.0)
Bjornsson et al. (2013) [44]	Iceland	Cross-sectional	DSM-IV diagnostic criteria for BDD, Yale-Brown Obsessive-Compulsive Scale Modified for Body Dysmorphic Disorder (BDD-YBOCS), Psychiatric Status Rating Scale for Body Dysmorphic Disorder (BDD-PSR), Body Dysmorphic Disorder Examination (BDDE)	BDD Data Form	Suicide attempts & Lifetime suicidal ideation	Sample 1: Individuals with BDD onset before age 18 Sample 2: Individuals with BDD onset age 18 or older	Sample 1: 164 Sample 2: 80	Sample 1: 48.8 Sample 2: 42.5	Sample 1: M = 32.6 (SD = 10.9) Sample 2: M = 32.4 (SD = 8.0)
Buhlmann et al. (2010) [45]	Germany	Cross-sectional	Self-report questionnaire assessing DSM-IV criteria for current BDD	Self-report questionnaire specific items	Suicide attempts & Lifetime suicidal ideation	General population	45	37.8	M = 48.9 (SD = 19.1)
Conroy et al. (2008) [46]	USA	Cross-sectional	Body Dysmorphic Disorder Questionnaire (BDD-Q), Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)	A brief form of the BDD Data Form	Suicide attempts & Lifetime suicidal ideation	Inpatients on general psychiatric unit	16	31.2	M = 31.9 (SD = 11.0)
Fontanelle et al. (2006) [47]	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), BDD Clinical Global Impression (BDD-CGI)	Specifically designed questionnaire	Suicide attempts & Current suicidal ideation	Treatment-seeking adults	20	45.0	M = 29.2 (SD = 8.6)
Frare et al. (2004) [48]	Italy	Cross-sectional	Semi-structured interview based on DSM-III-R diagnostic criteria	Clinical interview	Current suicidal ideation	Individuals with BDD	34	55.9	M = 24.7 (SD = 5.6)
Grant et al. (2001) [49]	USA	Cross-sectional	Body Dysmorphic Disorder Questionnaire (BDD-Q), Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)	Semi-structured interview based on Structured Clinical Interview for DSM-IV	Suicide attempts & Lifetime suicidal ideation	Inpatients on general psychiatric unit	16	37.5	M = 29.1 (SD = 9.1)
Grant et al. (2002) [50]	USA	Cross-sectional	Body Dysmorphic Disorder Questionnaire (BDD-Q), Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)	Semi-structured interview based on Structured Clinical Interview for DSM-IV	Suicide attempts & Lifetime suicidal ideation	Individuals with anorexia nervosa	16	0	M = 27.4 (SD = 9.7)
Jefferany et al. (2019) [51]	USA	Cross-sectional	Body Dysmorphic Disorder Questionnaire (BDD-Q), Body Dysmorphic Disorder Diagnostic Module (BDDM)	Specific questionnaire	Suicide attempts	Adolescent psychiatric patients	17	41.1	M = 13.7
Kelly et al. (2015) [52]	USA	Cross-sectional	Body Dysmorphic Disorder Questionnaire (BDD-Q), Structured Clinical Interview for DSM-IV Axis I Disorders Patient Version (SCID-I/P)	Medical records' chart review	Suicide attempts & Lifetime suicidal ideation	Veterans	12	83.3	M = 49.6 (SD = 13.7)
Mollmann et al. (2017) [53]	Germany	Cross-sectional	Self-administered questionnaire based on DSM-5 criteria (BDD-5), Body Dysmorphic Symptoms Inventory	Specific items of Body Dysmorphic Symptoms Inventory	Current suicidal ideation	Adolescents and young adults	11	18.2	–
Perugi et al. (1997) [54]	Italy	Cross-sectional	Diagnostic Interview for Dysmorphophobia (DID), Body Dysmorphic Symptom Scale (DSS)	Specific items of Body Dysmorphic Symptoms Scale	Current suicidal ideation	Individuals with BDD	58	59.0	M = 25.0 (SD = 5.9)
Phillips et al. (1993) [55]	USA	Cross-sectional	Semi-structured interview, Structured Clinical Interview for DSM-III-R (SCID)	n/r	Suicide attempts & Lifetime suicidal ideation	Individuals with BDD	30	57.0	M = 33.2 (SD = 11.3)

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Table 1A (continued)

Study	Country	Study design	Screening tool for DD	Screening tool for suicidality	Mode of suicidality	Target population	BDD sample size N	Men (%)	Age (years)
Phillips et al. (2005) [56]	USA	Cross-sectional	DSM-IV diagnostic criteria for BDD, BDD Form, Yale–Brown Obsessive–Compulsive Scale Modified for Body Dysmorphic Disorder (BDD-YBOCS)	BDD Data Form, Longitudinal Interval Follow-up Evaluation (LIFE)	Suicide attempts & Lifetime suicidal ideation	Individuals with BDD	200	31.5	M = 32.6 (SD = 12.1)
Phillips & Kelly (2009) [57]	USA	Longitudinal	DSM-IV diagnostic criteria for BDD, BDD Form, Yale–Brown Obsessive–Compulsive Scale Modified for Body Dysmorphic Disorder (BDD-YBOCS)	Hamilton Rating Scale for Depression (HAM-D)	Current suicidal ideation	Individuals with BDD	67	31.2	M = 32.1 (SD = 10.5)
Rief et al. (2006) [58]	Germany	Cross-sectional	Questionnaire based on DSM-IV diagnostic criteria for BDD	Specific questionnaire items	Suicide attempts & Current suicidal ideation	General population	42	40.0	M = 44.3 (SD = 17.2)
Schieber et al. (2015) [59]	Germany	Cross-sectional	Self-report questionnaire based on DSM-IV and DSM-5 criteria	Specific items of Patient Health Questionnaire (PHQ-9)	Current suicidal ideation	General population	62	21.0	M = 42.1 (SD = 13.6)
Semiz et al. (2008) [60]	Turkey	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)	Self-report questionnaire specific items	Suicide attempts	Individuals with borderline personality disorder	38	18.4	M = 22.1 (SD = 3.4)
Snorrason et al. (2019) [61]	USA	Cross-sectional	Revised version of the Body Dysmorphic Disorder diagnostic module based on DSM-5 criteria	Columbia Suicide Severity Rating Scale (C-SSRS)	Suicide attempts & Current suicidal ideation	Patients in a partial hospital program	36	27.8	–
Telles et al. (2006) [62]	Brazil	Cross-sectional	DSM-IV diagnostic criteria for BDD	n/r	Current suicidal ideation	Treatment-seeking adults	28	46.4	M = 28.04 (SD = 8.4)
Veale et al. (1996) [63]	UK	Cross-sectional	Structured Clinical Interview for DSM-III-R (SCID), Body Dysmorphic Disorder Examination (BDDE), Yale–Brown Obsessive–Compulsive Scale Modified for Body Dysmorphic Disorder (BDD-YBOCS)	n/r	Suicide attempts	Individuals with BDD	50	24.0	M = 32.6 Range: 19–58
Zimmerman et al. (1998) [64]	USA	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders Patient Version (SCID-I/P)	n/r	Suicide attempts	Psychiatric outpatients	16	25.0	M = 31.6 (SD = 10.8)

Note: M = mean; SD = standard deviation; n/r = not reported.

population showed a lower pooled prevalence of lifetime suicide attempts of 14.2% (95%CI: 7.4–22.5) compared to studies in clinical samples (rate of 38.9% (95%CI: 25.7–52.9)) (Fig. 3).

Only one study was conducted in South America [47] and this reported a lower prevalence of lifetime suicide attempts of 15% (95%CI: 3.2–37.9). One study was conducted in Asia with a very high prevalence of 97.4% (95%CI: 86.2–99.9) [60], 4 in Europe with a pooled rate of 18.1% (95%CI: 10.4–27.2) and a degree of heterogeneity of 49.8% and 11 in North America with a pooled prevalence of 36.4% (95%CI: 25.2–48.3) and heterogeneity of 84.2% (Supplemental Fig. 4). Age groups did not significantly account for the observed heterogeneity. Univariate meta-regression analyses carried out on the subsets of studies for which the covariate of interest was available (age, disease severity, comorbidities and family history of suicide), showed that only substance use was associated with a significantly increased prevalence (9 studies,  $b = 0.905$ ,  $se(b) = 0.348$ ,  $p = 0.009$ ,  $R^2 = 39.55\%$ ) (see Fig. 4).

### 3.1.2. Lifetime suicide attempts in HD

In HD prevalence ranged from 6.5% [65] to 75.9% [70]. The overall pooled rate was 24.1% (95%CI: 12.8%–37.6%).

Among medium-high quality studies ( $N = 4$ ) the pooled prevalence dropped from 24.1% to 15.7% (Supplemental Fig. 5), but heterogeneity remained high 80%. In the sensitivity analyses with leave-one-out approach, by excluding the study by Matsunaga et al., 2010 [70], the pooled prevalence dropped further to 14.4% (Supplemental Fig. 6).

All the studies included clinical populations. Similarly to the results in BDD, the studies in HD conducted in Asia ( $N = 2$ ) reported higher prevalence of lifetime suicide attempts (Supplemental Fig. 7).

No difference was found between studies including adults only and those including both adults and adolescents. In meta-regression analysis, there was a negative association between years of education and lifetime suicide attempts (4 studies,  $b = -0.195$ ,  $se(b) = 0.065$ ,  $p = 0.003$ ,  $R^2 = 67.02\%$ ) (see Fig. 5).

### 3.1.3. Lifetime suicide attempts in grooming disorders

For Grooming Disorders, the pooled prevalence of lifetime suicide attempts was 13.3% (95%CI: 5.9% - 22.8%), with a minimum of 3.7% [79] and a maximum of 33.3% [75], degree of heterogeneity was 76.5%.

All the six studies had poor quality (QAT score < 7) and in leave-one-out sensitivity analysis none of them significantly affected the pooled prevalence estimate. The studies included clinical populations and no difference in prevalence estimates was found by geographical area or age groups (adults or adolescents). No variable accounting for significant heterogeneity among the studies was identified in the meta-regression analyses.

### 3.2. Current suicidal ideation in OCRDs

For current suicidal ideation, we found 19 studies (11 studies for BDD, 5 for HD, 3 for Grooming Disorders). Fig. 6 shows the forest plot including all the disorders.

**Table 1B**  
Suicidality in HD – Descriptive characteristics of studies included in the meta-analysis ( $N = 8$ ).

Study	Country	Study design	Screening tool for HD	Screening tool for suicidality	Mode of suicidality	Target population	HD sample size N	Men (%)	Age (years)
Alonso et al. (2010) [65]	Spain	Cross-sectional	CY-BOCS Symptom Checklist	Open question as part of clinical interview, Item of the Hamilton Depression Rating Scale (HDRS), Beck Suicide Intent Scale (SIS)	Suicide attempts	Individuals with HD	62	–	–
Archer et al. (2019) [66]	USA	Cross-sectional	DSM-5 diagnostic criteria for HD, Structured Interview for Hoarding Disorder (SIHD), Saving Inventory-Revised (SI-R), UCLA Hoarding Severity Scale (UHSS), Clutter Image Rating Scale (C-IR)	Mini International Neuropsychiatric Interview (MINI)	Suicide attempts	Treatment-seeking individuals with HD	313	25.9	M = 59.0 (SD = 11.8)
Ayers et al. (2015) [67]	USA	Cross-sectional	DSM-5 diagnostic criteria for HD, Structured Interview for Hoarding Disorder (SIHD), Saving Inventory-Revised (SI-R), UCLA Hoarding Severity Scale (UHSS), Clutter Image Rating Scale (C-IR)	n/r	Current suicidal ideation	Older adults with HD	71	31.0	M = 67.0 (SD = 5.8) Range: 60–86
Balci & Sevincok (2010) [68]	Turkey	Cross-sectional	n/r	Scale for Suicidal Ideation (SSI)	Current suicidal ideation	Individuals with OCD	11	–	–
Chakraborty et al. (2012) [69]	India	Cross-sectional	Saving Inventory-Revised (SI-R), Clinical interview	n/r	Suicide attempts	Individuals with OCD	20	50.0	M = 31.1 (SD = 9.3)
Matsunaga et al. (2010) [70]	Japan	Cross-sectional	Face-to-face semi-structured interview	n/r	Suicide attempts	Individuals with OCD	54	44.4	M = 30.8 (SD = 8.9)
Torres et al. (2011) [71]	Brazil	Cross-sectional	Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Specifically designed questionnaire	Suicide attempts, Lifetime suicidal ideation & Current suicidal ideation	Individuals with OCD	297	–	–
Torres et al. (2012) [72]	Brazil	Cross-sectional	Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Open-ended question as part of clinical assessment	Suicide attempts, Lifetime suicidal ideation & Current suicidal ideation	Individuals with OCD	528	39.2	M = 35.9 (SD = 13.2)

Note: M = mean; SD = standard deviation; n/r = not reported.

### 3.2.1. Current suicidal ideation in BDD

The overall random-effects pooled prevalence of current suicidal ideation in the 11 studies for BDD was 37.2% (95%CI: 23.8–51.6%), with a heterogeneity  $I^2 = 87.8\%$ . The funnel plot and Egger's test did not indicate the presence of publication bias (Supplemental Fig. 8).

Results from sensitivity analysis including studies with moderate-high quality ( $N = 8$ ) were similar to those of the primary analysis (pooled rate: 36.3%, 95%CI: 19.7–54.8%,  $I^2 = 91.3\%$ ) (Supplemental Fig. 9). In a sensitivity analysis omitting the outlier study by Snorasson et al., (2019) [61] (prevalence of 91.7%), the overall pooled rate decreased from 37.2% to 30.6% and the heterogeneity dropped from 87.8% to 57.7% (Supplemental Fig. 10).

Subgroup analysis revealed no significant study variations among geographical area or among age groups. A higher prevalence was found in the clinical samples (40.3%) compared to the general population samples (25.8%), but the difference was not significant (Supplemental Fig. 11). No variable accounting for significant heterogeneity among the studies was identified in the meta-regression analyses.

### 3.2.2. Current suicidal ideation in HD

The overall random-effects pooled prevalence of current suicidal ideation in the 5 studies for HD was 18.4% (95%CI: 10.2–28.3%), with a high heterogeneity ( $I^2 = 91.8\%$ ) (see Fig. 6).

In the sensitivity analysis based on moderate-high quality studies ( $N = 3$ ) pooled rate and heterogeneity dropped to 10.9% (95%CI: 6.3–16.5%) and 61% respectively (Supplemental Fig. 12). Similarly, in the sensitivity analyses using the leave-one-out approach, by excluding the outlier study by Ayers et al. 2015 [67], the pooled prevalence rate dropped to 10.8% (95%CI: 8.1–13.7) and the heterogeneity declined from 91.8% to 43.7% (Supplemental Fig. 13).

The studies were all cross-sectional except one with a longitudinal design [57] and all involved clinical populations. One study that was conducted in Asia [68] and another conducted in North America [67] reported higher rates (36.4% and 46.5%, respectively).

### 3.2.3. Current suicidal ideation in grooming disorders

Only 3 studies investigated current suicidal ideation in the grooming disorders and found an overall random-effects pooled prevalence 40.4%

**Table 1C**  
Suicidality in GD – Descriptive characteristics of studies included in the meta-analysis ( $N = 8$ ).

Study	Country	Study design	Screening tool for GD	Screening tool for suicidality	Mode of suicidality	Target population	GD Sample size N	Men (%)	Age (years)
Grant et al. (2006) [73]	USA	Cross-sectional	Clinical interview	n/r	Suicide attempts	Individuals with BDD	79	17.7	M = 30.5 (SD = 11.3)
Grant et al. (2010) [74]	USA	Cross-sectional	Clinical interview based on proposed diagnostic criteria for PSP	n/r	Suicide attempts	Individuals with OCD or PSP	53	13.2	M = 34.2 (SD = 13.11)
Lovato et al. (2012) [76]	Brazil	Cross-sectional	n/r	n/r	Suicide attempts & Current suicidal ideation	Individuals with OCD	121	27.3	M = 31.0 (SD = 11.8)
Machado et al. (2018) [77]	Brazil	Cross-sectional	Modified version of Skin Picking Stanford Questionnaire (SPSQ)	Specific items of Patient Health Questionnaire (PHQ-9)	Current suicidal ideation	General population	259	17.8	M = 27.8 (SD = 8.4)
Phillips & Taub (1995) [78]	USA	Cross-sectional	–	–	Suicide attempts	Individuals with BDD	33	–	M = (SD =)
Seedat & Stein (1998) [79]	South Africa	Cross-sectional	Self-report questionnaire based on DSM-IV diagnostic criteria for Trichotillomania	n/r	Suicide attempts & Current suicidal ideation	Individuals with OCD	27	37.0	M = 29.8 (SD = 10.7)
Streichenwein et al. (1995) [80]	USA	Longitudinal	Minnesota Trichotillomania Assessment Inventory	n/r	Suicide attempts	Individuals with	16	12.5	M = 39.0 (SD = 12.0)

Note: M = mean; SD = standard deviation; n/r = not reported.

(95%CI: 35.7–45.3%). All three studies reported very similar rates with no significant heterogeneity, therefore we didn't run subgroup, meta-regression or sensitivity analyses.

### 3.3. Lifetime suicidal ideation in OCRDs

12 studies reported data on lifetime suicidal ideation in the OCRDs, 10 for BDD and only 2 for HD; no study was available for this metric in grooming disorders (see Fig. 7).

#### 3.3.1. Lifetime suicidal ideation in BDD

In BDD, the overall random-effects pooled lifetime prevalence was 0.661 (95% CI: 0.535–0.777), with a heterogeneity of  $I^2 = 87.2\%$  among studies. The funnel plot and Egger's test indicated the absence of publication bias (Supplemental Fig. 14).

Among moderate-high quality studies ( $N = 6$ ) the pooled prevalence was slightly higher (72.2%, 95%CI: 59.3–83.6%), but heterogeneity remained high ( $I^2 = 87.9\%$ ) (Supplemental Fig. 15). In leave-one-out sensitivity analyses, none of the studies significantly affected the pooled prevalence estimate.

The lowest prevalence was observed for the European study [45] conducted on general population. Studies conducted in Europe ( $N = 2$ ) reported a much lower pooled prevalence (46%) than those from North America (70.9%). However, heterogeneity within the two geographical areas remained high (Supplemental Fig. 16). Age groups did not significantly account for the observed heterogeneity. Meta-regression analyses in BDD did not identify any factors associated with increased rates of lifetime suicidal ideation.

#### 3.3.2. Lifetime suicidal ideation in HD

Only two studies conducted in Brazil investigated lifetime suicidal ideation in HD, and had similar results, with a pooled prevalence of 38.3% (95% CI: 35.0–41.6%).

## 4. Discussion

This meta-analysis of 38 independent studies for the first time shows that OCRDs as a group are at increased risk of lifetime suicide attempts and suicidal ideation. Our findings support the review of Angelakis and colleagues (2015) [20], which challenged the historical

prejudice that OCD is not a disorder characterized by high risk of suicide and in which the pooled effect size of the association between OCD and suicidality was estimated to be moderate to high (Hedges'  $g$  for suicide attempts: 0.64 and for suicidal ideation: 0.86), notwithstanding a high degree of heterogeneity [20]. A recent meta-analysis of 61 independent studies from our research group on suicidality in OCD for the first time provided accurate estimates of the prevalence of lifetime suicide attempts and suicidal ideation in individuals with a primary diagnosis of OCD, suggesting that individuals with OCD are at increased risk of suicide. Another meta-analysis by Angelakis and colleagues showed that BDD is also at increased risk [2]. No previous work has been conducted for the OCRDs as a group in order to compare suicide rates between the different disorders.

As we anticipated in our pre-registered protocol, in this meta-analysis the disorder with the highest pooled rate of lifetime suicide attempts is BDD (35.2% (95%CI: 23.4–47.8%)) and numerically exceeded the rate found for OCD in our recent meta-analysis (13.5% - 95%CI: 12.3–14.7%) [1]. Moreover, as the confidence intervals in this study did not overlap with the analogous confidence intervals in the previous OCD analysis, the values are likely to be significantly different (however, the comparisons are indirect and methodological differences such as sample characteristics and type of assessment might act as confounders).

The pooled rate of lifetime suicide attempts in BDD was also greater than that found for HD and Grooming Disorders (without reaching significance). The prevalence of lifetime suicide attempts in HD (24.1% - 95%CI: 12.8–37.6%) was also substantially greater than the rate previously found for OCD, but without reaching statistical significance (confidence intervals overlapping). The pooled lifetime rate of suicide attempts present in the Grooming Disorders (13.3% (95%CI: 5.9–22.8%)) was very similar to that found previously for OCD.

Concerning current suicidal ideation, in contrast to attempts, the disorders with the highest prevalence are the Grooming Disorders (40.4% (95%CI: 35.7–45.3%), (only 3 studies available, all of three reporting very similar rates)), followed by BDD 37.2% (95%CI: 23.8–51.6%). The pooled rate of current suicidal ideation in Grooming Disorders is numerically higher than that of OCD (27.3% - 95%CI: 21.4–33.5%). The disorder with the lowest rate of current suicidal ideation is HD (18.4% (95%CI: 10.2–28.3%)).



# Suicide attempts

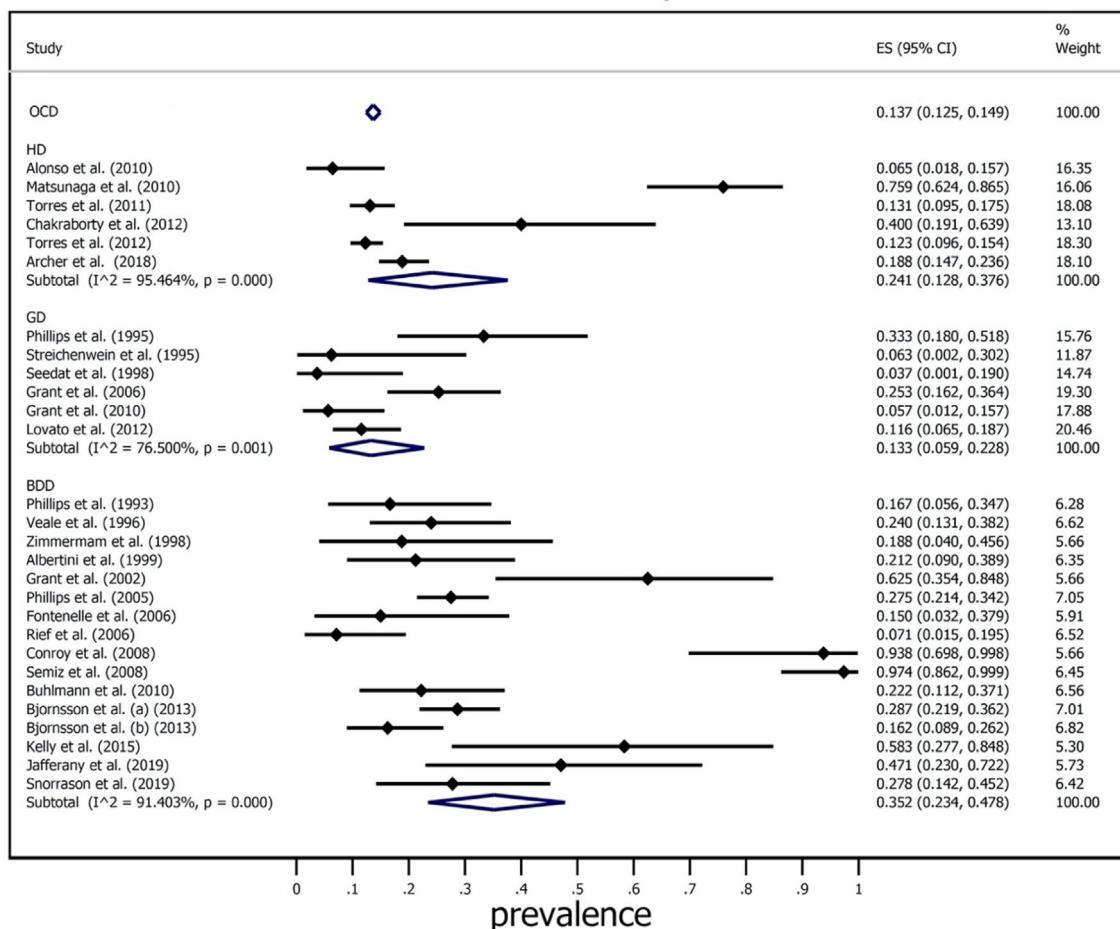


Fig. 2. Prevalence of suicide attempts in individuals with OCRDs. Random-effects meta-analysis.

These rates of suicide attempts and ideation are significantly higher than those seen in the general population: For example, in the World Health Organization (WHO) World Mental Health (WMH) Survey, in which 108,705 adults from 21 countries were interviewed, 12-month prevalence estimates of suicide ideation, plans, and attempts are 2.0%, 0.6%, and 0.3%, respectively, for developed countries and 2.1%, 0.7%, and 0.4%, respectively, for developing countries [84]. We need to bear in mind that a history of previous suicide attempts represents the main risk factor for completed suicide [25]. Regarding suicide attempts, the rates in BDD are close to those reported for schizophrenia (39.2% [85]) and higher than the rates in affective disorders (29.2% in bipolar disorder - 15.9% in unipolar depression [86]).

The clinical implication of these results is that clinicians should keep in mind that patients with OCRDs as a whole are at a relatively high risk of suicidal behaviour and this should be actively inquired about, including suicidal ideation, plans, personal history of previous suicide attempts. Indeed, a recent meta-analysis suggests that some kind of suicide communication occurs in about half of the individuals who eventually die by suicide [87]. Active inquiry is recommended, as it is likely that some individuals would not spontaneously disclose suicidality, as this class of disorders is known to be associated with secrecy and shame [88], which may have contributed to the historical prejudice that these patients were not at risk. Clinicians should therefore pay specific attention to eliciting communications of suicidal intentions, ranging from direct clues of the intention to commit suicide to indirect signs (e.g., selling things or cleaning out an office or a bedroom incongruously).

In our meta-analysis, a large heterogeneity was found among studies (I<sup>2</sup> with values between 76.5% and 95.4%). Rates of lifetime suicide attempts in BDD from individual studies, for example, varied from 7.1% [58] to 97.4% [60]. Through subgroup analyses and meta-regression, we attempted to explain part of the heterogeneity. For BDD, we found through subgroup analysis a significant difference in lifetime suicide attempts by geographical area, with a very high rate in Asia (only one study, Semiz et al., 2008 [60], 97.4%), a lower rate in Europe of 18.1% (with heterogeneity dropping to 49.8%) and a prevalence of 36.4% in North America (heterogeneity of 84.2%). As expected, studies in community samples showed a lower rate of 14.3% (95%CI: 6.5–25.3) compared to the rates in clinical samples (rate of 40.8% (95%CI: 26.8–55.6)), suggesting that the risk of suicide attempts in BDD is more significant in individuals referred to treatment centers (presumably with more severe or longstanding BDD).

A large proportion of patients with OCRDs did not have current or lifetime suicidal ideation, nor did they attempt suicide in their lifetime. This implies that differentiating the risk among patients by identifying predictors of suicidality is of foremost clinical importance and could result in improving our ability to screen subjects at greater risk needing more intensive and careful monitoring, so as to allocate clinical resources accordingly.

In this meta-analysis, we confirmed our a priori hypothesis, as stated in the protocol pre-registered with PROSPERO (CRD42020164395), that increased prevalence of substance use is significantly associated with increased rates of lifetime suicide attempts in studies including patients with BDD.

### Suicide attempts - BDD

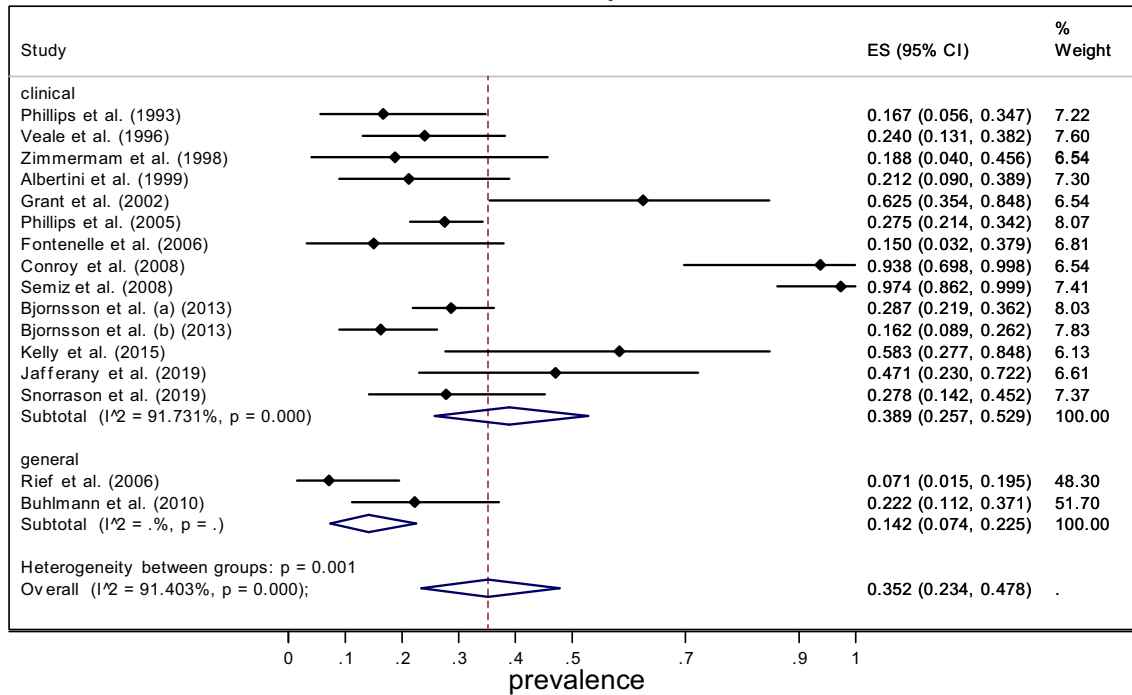


Fig. 3. Prevalence of suicide attempts in individuals with OCDs, by population type (general/clinical). Random-effects meta-analysis.

In the one individual study directly comparing patients with and without comorbid substance use, the rate of suicide attempts in individuals with BDD and substance use was 38.4% and this rate dropped to 18.9% in individuals with BDD but without substance use [111].

Comorbid substance use therefore represents a potential risk factor for suicide attempts in patients with BDD and should be explored in clinical risk assessment.

Of the OCDs, individuals with BDD are thought to show comparatively increased behavioural impulsivity [89], as exemplified by the risky behaviours that are commonly present (e.g., problematic internet usage [90], do-it yourself surgery [91]). Patients with BDD also show relatively high rates of abuse of different types of psychoactive substances (alcohol but also other drugs such as steroids, cannabis, hallucinogens - LSD, mescaline, magic mushrooms, etc. [92]) compared to OCD (mainly

alcohol, [93]). Substance use is known to be a risk factor for suicide attempts in OCD [1], as well as other severe mental illnesses (Schizophrenia, Bipolar Disorder, Unipolar Disorder and Personality Disorders) [94], suggesting this comorbidity may increase risk across many if not all mental disorders. Clinicians should therefore actively inquire about consumption of alcohol and/or other illicit substances in individuals presenting with OCDs, in order to identify those in need of closer monitoring for suicide prevention.

Addictive behaviours and substance abuse in OCDs may also reflect poorer latent impulse control, which may independently raise the risk of suicidal behaviours. Poor impulse control has been linked to suicidality in affective disorders such as Major Depression Disorder and Bipolar Disorder [95]. OCDs are already known to be associated with poor impulse control when tested on laboratory-based tasks [96]. For example, patients with BDD show elevated reward-based impulsivity in the Cambridge Gambling Task [89]. The subgroup of patients with OCDs who abuse substances may represent a particularly impulsive group. In a preliminary study, increased attentional impulsivity, measured through the Barratt Impulsiveness Scale, and poorer reward-based decision making, measured through the Cambridge Gambling Task, were identified in a subsample of patients with OCD and comorbid Alcohol Use Disorder compared to a non-comorbid subgroup [93].

Impulsivity and compulsivity are multidimensional constructs, thought to be mediated by overlapping as well as distinct neural substrates. Impulsivity can be fractionated into various different domains e.g. motor, decision-making, reflection impulsivity [97]. The impact of specific forms of impulsivity on suicidal behaviours within the OCD population merits further study. A recent study investigating suicidal behaviour in patients with depression and anxiety [98] found that impulsive decision making and risk taking on objective tests (Cambridge Neuropsychological Test Automated Battery (CANTAB) [99] differentiated those with suicidal ideation. To date, in studies of OCD, impulsive decision making as measured by the Cambridge Gambling Task [99] has only been inconsistently found [100,101], and perhaps when present could indicate a more impulsive subgroup, potentially with a greater risk of suicidal behaviour. If substantiated in other OCDs, findings such

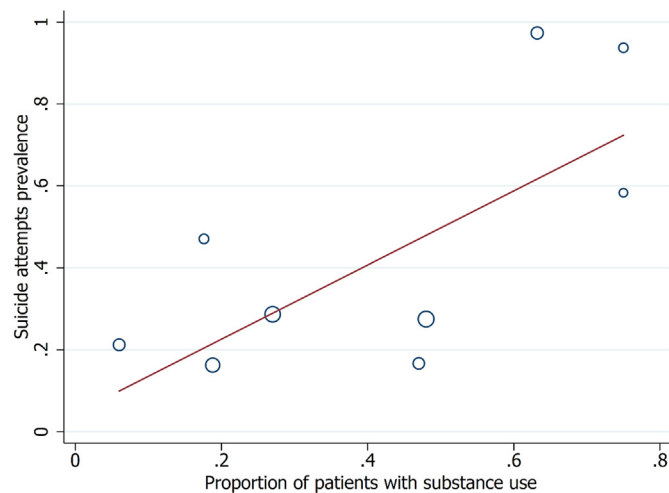


Fig. 4. Scatter plots showing the significant association between the prevalence of suicide attempts (y axis) and substance use (x axis) in BDD.

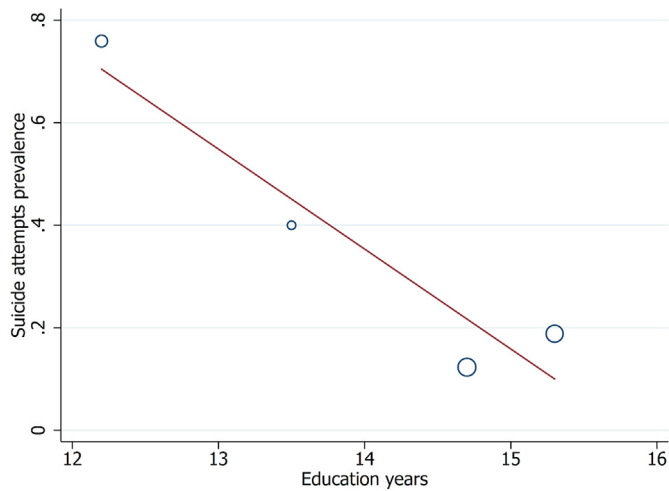


Fig. 5. Scatterplot showing the significant association between the prevalence of suicide attempts (y axis) and the education years (x axis) in HD.

as these could be of great clinical relevance and may even point towards trans-diagnostic markers of suicidality. For example, application of clinical instruments, such as the Barratt Impulsiveness Scale [102] or even

neurocognitive tasks such as the Cambridge Gambling Task, could be of potential value for routine use in the clinical setting to help identify those with higher risk of suicidality.

HD showed a high rate of lifetime suicide attempts (24%) and a comparatively lower rate of current suicidal ideation (18.4%), while in all the others OCRDs, the rate of current suicidal ideation was higher than the rate of lifetime suicide attempts. It is possible that this finding could be explained by the particular impulsivity profile and poor insight that also characterizes individuals with this disorder [5,103]. We could infer that patients with HD may not think much about killing themselves and may impulsively attempt suicide without premeditation. This piece of information is important for clinicians to know, as individuals with HD could possibly attempt suicide in a particularly unpredictable way (without significant premeditation). In other words, accurate suicide risk assessment in patients with HD should not rely exclusively on enquiry about the presence of suicidal ideation. Instead, especially for HD, a previous history of impulsive behaviours and/or suicide attempts is likely to be more relevant to assess current suicide risk.

In contrast, the number of educational years was associated with lower rates of lifetime suicide attempts in HD. We hypothesize that this finding could relate to the degree of cognitive impairment that is recognized to be associated with this particular disorder [104]. Clinicians may therefore be guided by educational history when assessing an individual with HD and consider poor education another possible

### Current suicidal ideation

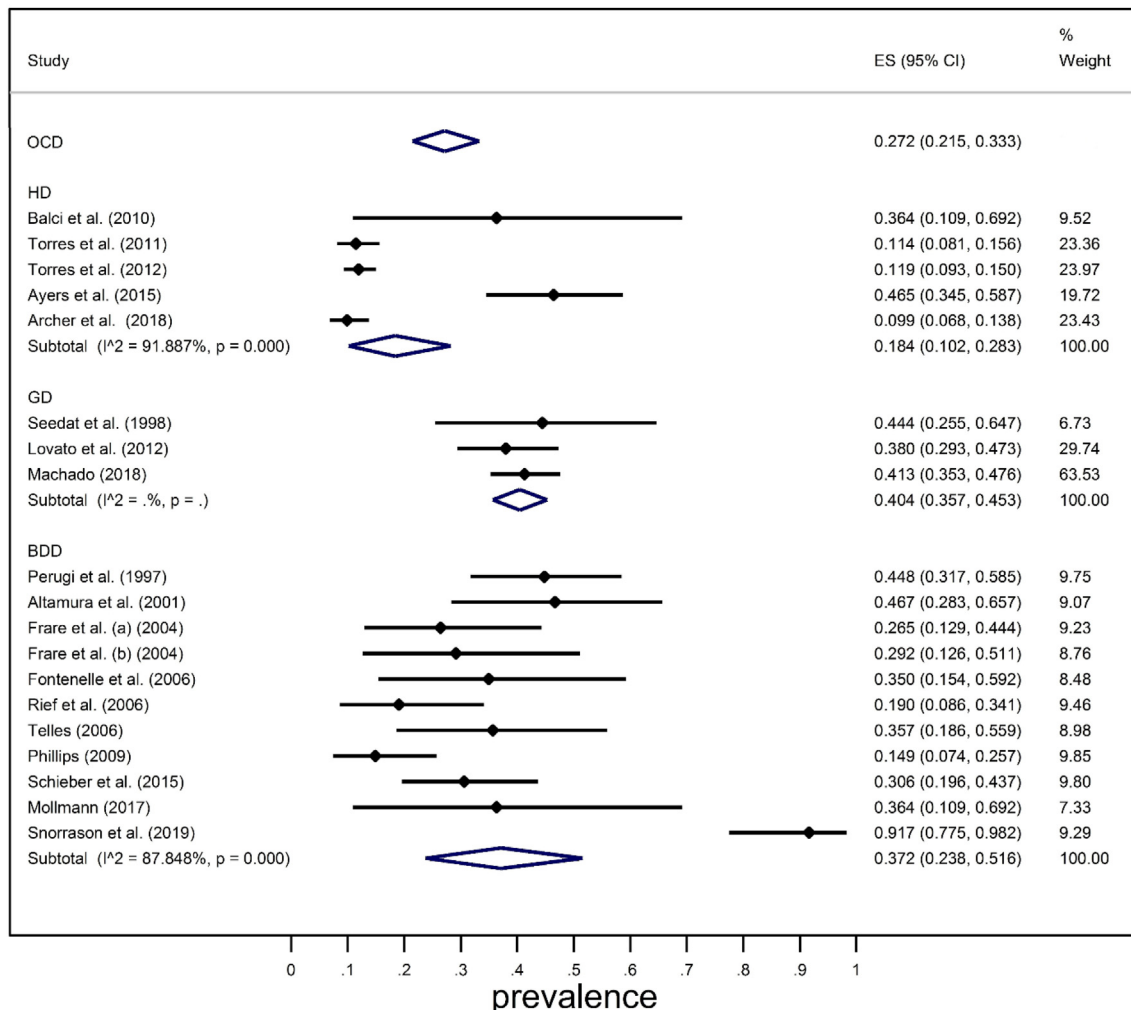


Fig. 6. Prevalence of current suicidal ideation in individuals with OCRDs. Random-effects meta-analysis.

## Lifetime suicidal ideation

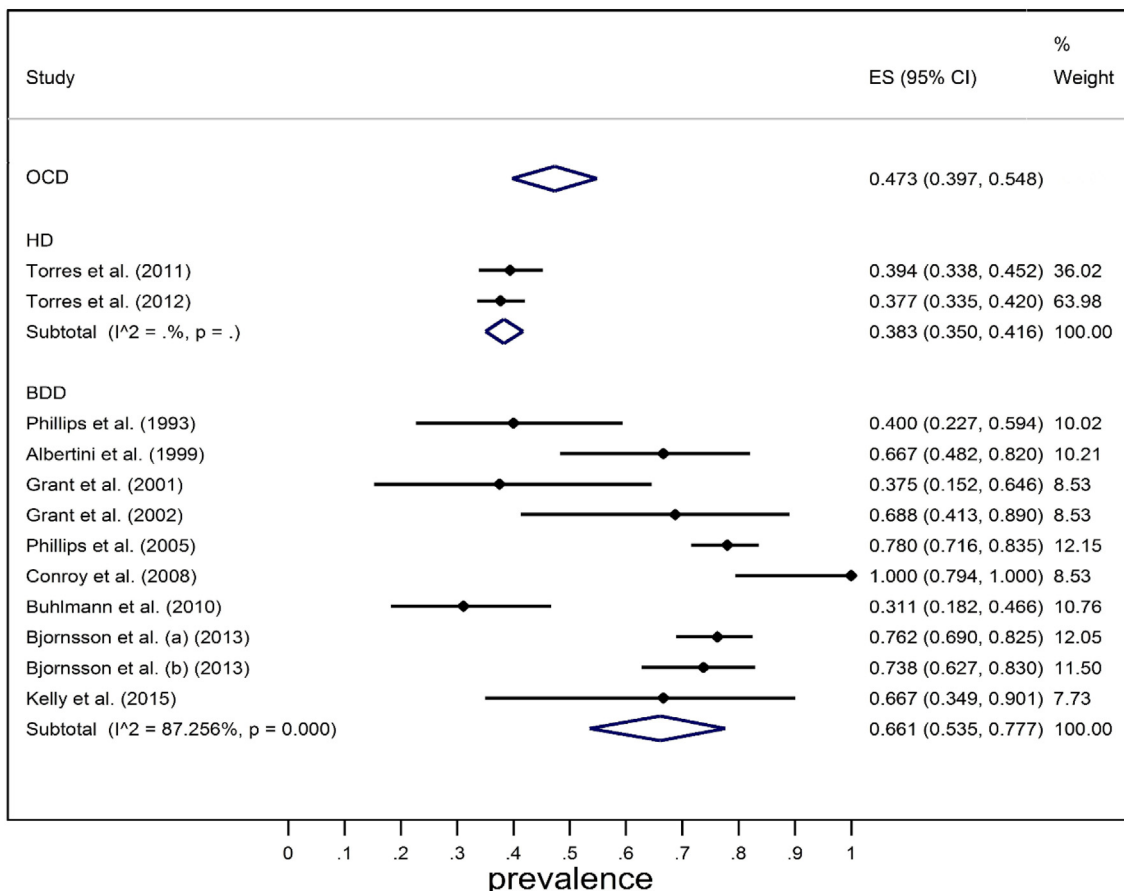


Fig. 7. Prevalence of lifetime suicidal ideation in individuals with OCRDs. Random-effects meta-analysis.

marker of suicidality. We should, however, note that the studies of HD conducted in Asia ( $N = 2$ ) reported a much higher prevalence of suicide attempters (67%) and a subgroup analysis by country for suicide attempts in HD explained part of the heterogeneity between results (see Fig. 6). A similar difference in suicide attempts by geographical area was found in BDD, where studies conducted in Asia also reported a higher prevalence of attempts. Explanations for this finding could be several and cultural factors could come into play.

As to current suicidal ideation, we found that the disorders with the highest rates were the Grooming Disorders (only three studies were available and all gave similar rates) and BDD. Our results suggest that individuals with Grooming Disorders still think a lot about suicide even if they do not put it into action as much as do the other OCRDs. The finding that the lifetime suicide attempt rates in Grooming Disorders do not reach the high rates seen in HD and BDD, hints at the presence of some kind of protective factor at play in the Grooming Disorders, that we are not able to fully explain in this present work. It is possible, for example, that those disorders characterized by a more habitual behaviour pattern (SPD and TTM) with comparatively less involvement of the “affective” brain circuitry and more involvement in the “cognitive-executive” circuits [105], could be at lesser risk than those disorders characterized by a greater affective component and cognitive burden (BDD, HD and OCD).

#### 4.1. Limitations and strengths

We could not include completed suicide rates in the quantitative analyses, as such data in OCRDs are scant. Presumably, a long duration of illness, which increases the risk of socio-functional

impairment and secondary depression, and a long duration of untreated illness, which is an unfavourable prognostic factor, increase suicide risk in OCRDs. Regrettably, we were not able to quantitatively explore this association due to the shortage of studies reporting information on duration of illness/untreated illness and suicidality. The most updated and large epidemiological study investigating complete suicide rates in OCD [106], found that these patients had an increased risk of dying by suicide in a 44-year study period (unadjusted OR: 9.83, incidence rate: 1.48%). No similar longitudinal studies have been published for other OCRDs. It may be that, as seen in studies of affective disorders [107], factors associated with suicide attempts and suicidal ideation are different from those predicting completed suicide. Future prospective studies are needed to address this specific issue and progress from hypotheses generated through tests of association to confirmatory analyses with specific reference to the population with OCRDs.

The main limitation of our analysis is that the number of the studies investigating suicidality in some OCRDs, in particular Hoarding Disorder, Trichotillomania and Skin Picking Disorder, is limited. This forced us to merge Trichotillomania and Skin Picking Disorder into the subgroup of Grooming Disorders, due to their similar psychopathological and neurocognitive features [105].

Despite establishing strict criteria for the inclusion of studies in the meta-analysis, a wide heterogeneity was found in the prevalence of lifetime suicide attempts and suicidal ideation that to some extent limits our confidence in the findings. However, by performing several subgroup and meta-regression analyses, we attempted, when possible, to identify various factors that explained this heterogeneity that we integrated in our interpretation of results.

Another limitation, which contributed to the heterogeneity of results, is the use of different instruments to assess suicide attempts and suicidal ideation in several of the studies included in the meta-analysis. Fifteen studies (38.4%) used open-ended questions as part of the clinical interview to obtain information about lifetime suicide attempts or suicidal ideation, or not validated specifically designed questionnaires. Some of the studies used a single item of a more complex rating scale (e.g. the Hamilton Depression Rating Scale (HAM—D)), others used specific validated scales (e.g. Scale for Suicidal Ideation (SSI) – Balci & Sevincok (2010) [68], Beck Suicide Intent Scale (SIS) – Alonso et al. (2010) [65]), and only 1 study (Snorrason et al. (2019) [61]) used the Columbia Suicide Severity Rating Scale (C-SSRS), a specific instrument which allows the dimensional analysis of suicidal ideation, its severity and suicidal behaviours. Moreover, the large majority of the studies included were cross-sectional; combined with the lack of use of specific instruments, this can make the estimate of suicide attempts or suicidal ideation rates in that specific study unreliable. The lack of a shared nomenclature to define suicide related terms is a common issue in studies investigating suicidal ideation and behaviours, as well as the lack of lethality assessment of attempts. Future studies with a longitudinal design and proper definition of suicide phenomena [108,109], should further investigate this topic in OCD in order to advance suicide research and prevention.

Despite these limitations, our meta-analysis has several strengths; for the first time it investigates suicidality in several OCDs and aims to find differences in suicide rate in this group of different disorders. Our work includes a significant number of studies ( $N = 38$ ), both clinical and epidemiological ones, most of moderate/good quality, performed in individuals of all ages with a primary diagnosis of OCDs. Only three studies investigated suicidality in children with OCD and we have identified this lack of data as an evidence gap that needs to be filled with future research. Moreover, to examine the potential contribution to suicidality of several generic/transdiagnostic factors, OCD-specific factors and comorbidities, we considered separately factors potentially contributing to increasing suicide attempts and those contributing to suicidal ideation. We pre-registered the protocol of this meta-analysis on the International Prospective Register of Systematic Reviews Prospero (Center for Reviews and Dissemination, University of York) and the findings are in line with our a-priori hypotheses.

## 5. Conclusions

Our study builds upon previous results showing that individuals with OCD are at significant risk for thinking about and attempting suicide. For the first time, we separately collected data on suicidal ideation and suicide attempts in the other OCDs. Our findings show that about one out of three patients with BDD, about one out of four with HD and about one out of ten with Grooming Disorders attempts suicide during his/her lifetime. Of all the OCDs, BDD carries the highest risk of suicide attempts and substance use could be a red flag that might increase the risk both in OCD and BDD. Despite modest rates of suicidal ideation, HD also presents a high risk of lifetime suicide attempts, with poor education also potentially representing a red flag. Clinicians are recommended to use this information to carefully assess suicidality in patients with all types of OCD.

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Prof. Umberto Albert declares that in the past 3 years has been a consultant and/or a speaker for Angelini, Neuraxpharm, Janssen Cilag, Lundbeck, Innova Pharma.

Prof. Giuseppe Maina declares that in the past 3 years has been a consultant and/or a speaker for Janssen Cilag, Otsuka, Angelini, Lundbeck, Boehringer, Innova Pharma.

Prof. Domenico Berardi, Prof. Marco Menchetti, Prof. Paola Rucci, Dr. Luca Pellegrini, Dr. Sofia Burato, Dr. Elisa Maietti report no financial relationships with commercial interests.

## Appendix 1

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.comppsy.2021.152246>.

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