Title: The Current Status of Mental Contamination in Obsessive Compulsive Disorder: A Systematic Review

Short title: Systematic Review of Mental Contamination in Obsessive Compulsive Disorder

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Interest Statement

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Abstract

Background and Objectives*:* Over the past 25 years Mental Contamination (MC) has become recognised as a distinct construct, particularly in relation to Obsessive Compulsive Disorder (OCD). MC is defined as feelings of contamination, often located internally, that arise in the absence of contact with a contaminant, with the source proposed to be human. Despite considerable interest from researchers and clinicians, there has not been a systematic review on the relationship between MC and OCD. Therefore, a systematic review was conducted to summarise and synthesise the current status of phenomenological and experimental evidence, mechanisms, assessment, measurement, and treatment of MC in OCD (PROSPERO: CRD42021223119).

Methods: All study designs were eligible provided the focus of the study was on MC and the implications of the study were linked to OCD. We searched PsychINFO, Embase, Medline, Ethos, ProQuest, conference abstracts and trial registries between 1990 and 2021. The Mixed Methods Appraisal tool was used to assess methodological quality of included studies.

Results: We found 58 reports with a total of 67 studies that met criteria for inclusion in the review. Twenty-three of these studies used clinical samples, 28 were experimental, 12 focused on phenomenology and 8 addressed treatment. The quality of the studies was variable.

Limitations: Grey literature was not included, thus there may be further unpublished MC studies that have not been included in the review.

Conclusions: Based on the findings, mental contamination is a robust clinical construct within OCD that has important implications for understanding and treating the disorder.

Key Words: Obsessive Compulsive Disorder; Mental Contamination; Cognitive Behavioural Therapy

Highlights

- A systematic review examined the role MC in OCD
- We reviewed how MC in OCD is currently assessed, measured and treated.
- A total of 58 reports which comprised 67 studies were included in the review.
- The review findings indicate that MC is a distinct construct.
- The relationship between MC and OCD has implications for assessment and treatment.

This special issue, dedicated to Professor Adam Radomsky, has a theme of 'The importance of importance', inspired by his seminal paper on the topic in 2004. Several of the authors of this paper were privileged to bear witness to the emergence of the thinking behind the construct of the 'importance of importance' throughout the previous decade. The notion that obsessions were caused by the catastrophic misinterpretation of intrusive thoughts was the subject of much protracted debate in the mid-1990s, culminating in Rachman's classic papers on the topic (Rachman, 1997, 1998). The seed of 'the importance of importance' was sown. For the next decade, the principle was applied to various aspects of OCD giving rise to constructs such as thought action fusion (Shafran et al., 1996) and, importantly, mental contamination (MC) (Rachman, 1994). Adam Radomsky was a PhD student in the laboratory when these constructs were being developed and debated. His contribution to their development cannot be overstated. He both inspired them, and was inspired by them, and his illustrious career reflects so many of the principles that were developed at that time. His work on MC in particular, is exceptional and has truly transformed lives. We therefore considered it a fitting tribute to Adam's work on the importance of importance to conduct a systematic review of the literature on MC. We hope that it helps demonstrate the close interrelationship between research and practice, and how ideas that began in the lab can end with effective treatment interventions.

The fear of contamination is complex, intense, unpleasant, easily provoked, difficult to control, variable in content, often culturally accepted and tinged with magical thinking. Usually, the fear is triggered by physical contact with a contaminant associated with disease, dirt, pollution or harmful substances such as waste products or blood. However, it is also possible to experience MC; the pervasive experience of feeling internally dirty, polluted or disgusted in the absence of physical contact with a tangible contaminant (Rachman, 1994, 2004, 2006). MC is distinguished from physical or contact contamination in that it can be evoked by cognitions, memories and mental images alone.

The cognitive behavioural theory of MC proposes that the feelings of internal dirtiness results from misinterpretations of the personal significance of a physical and/or psychological violation or moral betrayal (Rachman, 2006, 2010). In some cases, this can include the person themselves as the perpetrator, either through engaging in a personally defined immoral act, or arising from the occurrence of unwanted, intrusive, repugnant thoughts or urges. The experience of MC is then postulated to be maintained by a range of misappraisals and cognitive biases including thought-action-fusion (Shafran et al., 1996), responsibility, ex-consequential reasoning, mislabelling of mood states, and the transformation of benign stimuli into triggers (Rachman, 1997; 1998).

In comparison to CC fears (which are typically evoked instantly by physical contact in a localised area and transiently responsive to compulsive cleaning/washing), MC is typically experienced as diffuse feelings of pollution that create an internal dirtiness without a circumscribed site of contamination. As these internal sensations are not easily accessible, compulsive cleaning and hand washing is misdirected and rarely successful (Rachman, 1994, 2004, 2006).

MC has attracted considerable attention from both researchers and clinicians since the concept of mental pollution was first introduced in Rachman's seminal paper over 25 years ago

(Rachman, 1994). However, to our knowledge, to date there have been no published systematic reviews which summarise and synthesise findings from studies exploring the relationship between MC and OCD. Therefore, the overarching aim of this systematic review was to assess the current status of phenomenological and experimental evidence, mechanisms, measurement assessment, and treatment of MC in OCD. Specifically, we aimed to address the following four research questions;

1) What is the role of MC in OCD?

2) What experimental evidence underpins the role of MC in OCD?

3) How is MC in OCD best measured and assessed?

4) What is known about how to treat MC in OCD?

Method

A review protocol was written and registered on PROSPERO (registration: CRD42021223119) prior to commencing the review search. PRISMA 2020 guidelines were followed in the reporting of this review (Page et al., 2021) (Table 1S[1]).

Study inclusion criteria

Study Design.

All possible study designs were eligible for inclusion. We included studies if they were published in a peer reviewed journal, submitted as a part of a theses in English language, or were presented at a conference (conference abstracts were included if full details of the study could be obtained from the authors). We excluded book chapters and theoretical/ conceptual papers.

[1] Table numbers denoted with 'S' (e.g., 1S) are included in supplementary material.

Participants.

For studies utilising a clinical population participants were children or adults who had self-identified OCD as their main presenting problem and/ or had a diagnosis of OCD according to the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) (APA, 2013), International Classification of Diseases, 10th revision (ICD 10) (WHO, 1992) or other internationally accepted diagnostic criteria (e.g., DSM-IV, DSM-III-R). Studies were not excluded because of comorbidity, provided that the primary presenting problem was OCD. For experimental and observational studies utilising analogue samples, we included participants who were students and community members, where the focus of the study was on MC and the implications of the study were explicitly related to OCD (rather than another psychological disorder e.g., PTSD). For participants in all studies no restrictions were applied for age, sex, ethnicity, setting or use of medication.

Intervention/ Exposure.

We used the definition of MC as being distinguishable from physical contamination in that it can be evoked by cognitions alone, specifically those relating to experiences of being humiliated, deceived, violated or degraded, with the perpetrators of these experiences becoming a "human contaminant" (Rachman, 2006). We therefore included all intervention, experimental and assessment studies where a measure of MC had been used and/or the focus was on the treatment of/ or understanding of MC.

Comparator/ Control.

As there were no restrictions on the types of study design eligible, all comparators/ controls were accepted. It was acknowledged that not all studies would have a specific control group/ comparator (e.g., qualitative), and thus were eligible for inclusion.

Outcome.

Primary Outcome for Mechanisms of MC: We examined the experimental paradigms used to induce and manipulate MC, as well as identified mediators and moderators of MC.

Primary Outcome for Measurement and Assessment of MC: We examined the psychometric properties of tools developed for measurement of MC. For qualitative reports we aimed to synthesise the phenomenological aspects of MC relevant to assessment.

Primary Outcome for Treatment of MC: We examined changes in MC symptoms from pre-to-post treatment, measured using standardised scales.

Search Methods for Identification of Studies

Electronic searches.

We conducted an electronic literature search of PsycINFO (APA PsycNET), EMBASE, Medline and The Cochrane Library (including the Cochrane Central Register of Controlled Trials (CENTRAL)) for articles published between 1990 and June 2021. We used Medical Subject Headings (MeSH) or equivalent terms specific to each database, related to: "obsessive compulsive disorder", "mental contamination", "mental pollution" and "transformation obsessions" (See Table 2S for further details and full search strategy).

Data Collection and Analysis

Selection of studies.

All identified references were imported into Covidence Systematic Review software (Covidence, 2021). Title and abstract screening as well as full-text screening were conducted by two independent reviewers (BLINDED). Any conflicts were discussed between the reviewers and in consultation with a third reviewer (BLINDED) when necessary. Where full text articles were not available via interlibrary loan the authors were contacted directly. Reasons for exclusion of ineligible studies were recorded (Table 3S). The reference lists of all

included studies were searched by one reviewer (BLINDED) for further relevant studies. The selection process was recorded via a PRISMA flow chart (Figure 1) (Page et al., 2021).

Data Extraction and Management

Two reviewers (BLINDED) independently extracted data from all included studies, and a third reviewer (BLINDED) checked over the extracted experimental studies data. Pertinent information was extracted from each study (See Table 4S for full details of information extracted).

Assessment of Risk of Bias in Included Studies

The Mixed Methods Appraisal tool (MMAT) (Hong et al., 2018) was used to assess the quality of included studies by two reviewers (BLINDED (See Table 5S for details). Each record was given an overall assessment of 'quality' summary score, represented as a fraction indicating the number of criteria definitely met, out of the number of criteria assessed.

Planned Methods of Analysis

We planned to use a narrative approach to summarise and synthesise findings from included studies. We will initially present a summary of the characteristics of included studies. Following this the narrative synthesis will be structured in relation to the research questions of the review which are focused on 1. Phenomenology, 2. Experimental evidence/ mechanisms, 3. Assessment and measurement and 4. Treatment of MC in OCD.

Results

Searches

Searches of all sources retrieved N = 595 records. Of these records N = 481 were screened at the title and abstract stage and N = 77 at full text. We included N = 58 reports that

comprised a total of *N* = 67 studies that met eligibility criteria (Figure 1). Of the *N* = 58 reports, *N* = 55 were peer reviewed published papers and *N* = 3 were dissertations (Herba, 2005; Piper, 2013; Firmin, 2018).

Characteristics of Included Studies

An overview of the characteristics of the included records is provided in Table 1. The reports have been divided by category (i.e., phenomenology, experimental etc.) in line with our research questions and reports are presented chronologically within each category. The year of publication ranged from 2005 to 2021. The largest number of reports had been conducted in the UK (*n* = 18), followed by Canada (*n* = 11) and the USA (*n* = 10).

Participants

Twenty-three studies utilised clinical samples of participants with OCD. The Anxiety Disorders Interview Schedule – IV (ADIS-IV; Brown et al., 1994) was the most widely used diagnostic tool. The mean age of participants with OCD was *M* = 33.93 (*SD* = 2.30).

Non-clinical student/ analogue samples were used in *n* = 32 studies, with *n* = 4 studies utilising student samples with elevated OC symptoms. The mean age of student/analogue participants was 20.97 (*SD* = 1.94) (See Table S6 for detailed text summary).

Study design

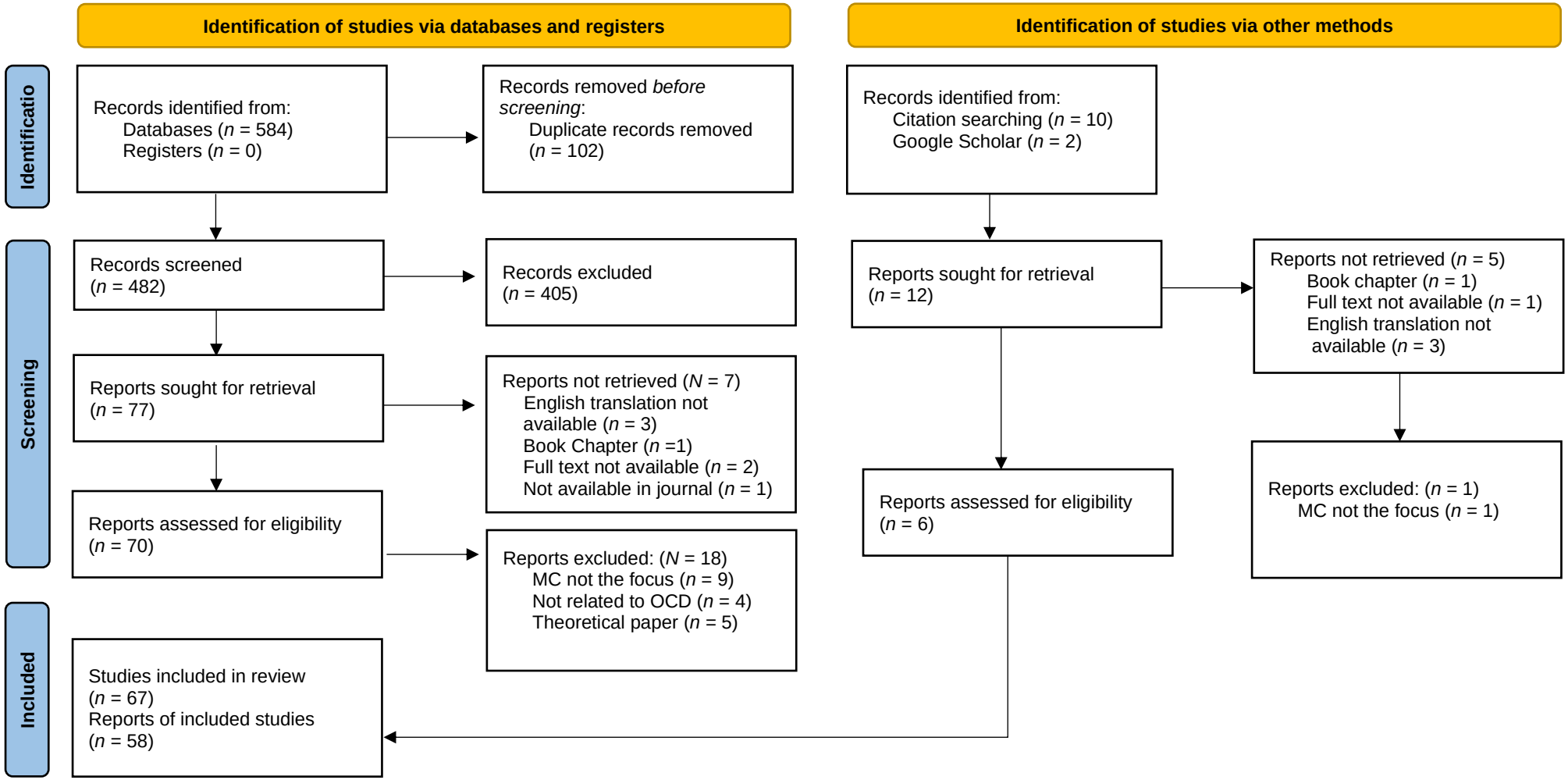
As expected, a range of study designs had been utilised. Most studies employed a quantitative methodology (*n* = 56) of which *n* = 28 utilised an experimental design and *n* = 28 cross-sectional. Qualitative interview studies (*n* = 3), mixed methods (*n* = 1) as well as case series (*n* = 3) and single case studies (*n* = 4) were used.

Settings included: University lab (*n* = 29); online-participation - questionnaire completion (*n* = 27); outpatient clinic (*n* = 5); university-based outpatient clinic (*n* = 3); and *n* = 3 qualitative interviews did not specify the setting.

Risk of Bias in Included Studies

A total of *N* = 60 studies were assessed. For reports that included more than one study and if the studies utilised different designs, the studies were assessed separately, and each given a summary score (Table 1). *N* = 3 studies failed to meet both of the screening questions, due to the absence of a clear research question, hypothesis or study aim, however the methodological criteria of these studies were still assessed. Overall, the quality of studies was good with 68% rated as high quality, 29% medium quality and 3% low quality (see Tables 5.1 - 5.6S for the individual criterion ratings of each study).

Figure 1.
PRISMA 2020 diagram of study identification and selection.



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: http://www.prisma-statement.org/

Table 1.
Characteristics of included studies

ID	Study	Country	Participant	OCD diagnostic/ severity measure M(SD)	N	Female %	Mean Age (SD)	Study design	Measure of MC	MC Mean (SD)	MMAT Score
Phenomenology of Mental Contamination in OCD											
1	Coughtrey et al. 2012a.	UK	S1: Previous OCD diagnosis S2: Formal OCD diagnosis	S1: OCI-R 36.19 (15.49) S2: ADIS-IV	S1: 177 S2: 54	S1: 73.4 S2: 64.8	S1: 34.40 (11.43) S2: 33.39 (10.89)	Cross-sectional	VOCI-MC	S1: 40.56 (26.69) S2: 37.34 (26.17)	5/5
2	Coughtrey et al. 2012b.	UK	Formal OCD diagnosis	ADIS-IV	20	65	36.15 (11.01)	Qualitative	N/A	N/A	5/5
3	Coughtrey et al. 2014b.	UK	University students w VOCI-MC $\geq$ 10	N/A	60	81.6	20.53 (4.30)	Experimental	VOCI-MC	NR	5/5
4	Coughtrey et al. 2015	UK	Formal OCD diagnosis	ADIS-IV	15	66.6	38 (11.41)	Qualitative	Na	Na	5/5
5	Coughtrey et al. 2018	UK	University students and community participants	N/A	120	82	28.92 (7.98)	Cross-sectional	VOCI-MC	13.87 (16.86)	5/5
6	Firmin, 2018	UK	G1:Previous OCD diagnosis w bullying G2: Previous OCD diagnosis No bullying G3: Community control w bullying G4: Community control No bullying	OCI G1:56.7 (28.1) G2: 52.3 (37.7) G3: 17.9 (21) G4: 20 (15.1)	G1:16 G2: 4 G3: 11 G4: 42	74	Range: 17 – 68	Mixed-Methods	VOCI-MC	G1: 19.6 (18.1) G2: 3.6 (6.2)	1/5
7	Jacoby et al. 2018	USA	Undergraduate students	N/A	304	69.4	18.61 (1.33)	Cross-sectional	VOCI-MC	13.46 (11.63)	4/5
8	Zysk et al. 2018a	UK	Formal OCD diagnosis	ADIS-IV	30	53.3	33.1 (10.1)	Qualitative	VOCI-MC	49.00 (22.93)	4/5
9	Ojserkis 2020	USA	Undergraduate students	N/A	141	76.6	20.14 (1.37)	Cross-sectional	VOCI-MC	17.38 (15.78)	5/5

ID	Study	Country	Participant	OCD diagnostic/ severity measure M(SD)	N	Female %	Mean Age (SD)	Study design	Measure of MC	MC Mean (SD)	MMAT Score
10	Pagdin et al. 2021 (Study 2)	UK	G1: Self-report OCD G2: Anxiety G3: Depression G4: University students & community participants	OCI-R G1:38.52(14.55) G2:17.48(10.44) G3:15.22(14.89) G4:5.5 (6.81)	G1: 23 G2: 21 G3: 18 G4: 21	G1: 87 G2: 82 G3: 77.8 G4: 80.9	G1: 32.5 (9.79) G2: 33 (9.79) G3: 39.2 (12.03) G4: 37.1 (11.11)	Cross-sectional	VOCI-MC	G1: 30 (29.33) G2: 8.52 (9.31) G3: 7.67 (13.86) G4: 3.10 (4.25)	5/5
11	Howkins et al. 2021	UK	G1: Self-report OCD High MC G2: Self-report OCD Low MC G3: Depression G4: Community control	OCI G1:88.83(29.51) G2:52.57(23.67) G3:19.32(9.29) G4: 10.43(9.56)	G1: 60 G2: 61 G3: 28 G4: 46	G1: 80 G2: 83.6 G3: 71.4 G4: 80.4	NR	Cross-sectional	VOCI-MC	G1: 52.60 (15.09) G2: 12.3 (7.82) G3: 7.54 (9.03) G4: 2.87 (6.20)	5/5
The Experimental Induction of Mental Contamination: The "Dirty Kiss" Paradigm											
12	Fairbrother et al. 2005	Canada	Undergraduate Students	N/A	121	100	20.51 (3.17)	Experimental	N/A	N/A	3/5
13	Herba, 2005	Canada	Undergraduate Students	N/A	128	100	20.73 (4.73)	Experimental	MPQ	NR	3/5
14	Herba & Rachman, 2007	Canada	Undergraduate Students	N/A	120	100	20.73 (4.73)	Experimental	MCR	N/A	3/5
15	Elliott & Radomsky, 2009	Canada	Undergraduate Students	N/A	148	100	22.86 (4.46)	Experimental	MCR	N/A	4/5
16	Radomsky & Elliot, 2009	Canada	Undergraduate Students	N/A	70	100	23.30 (4.77)	Experimental	MCR	N/A	3/5
17	Elliott & Radomsky, 2012	Canada	Undergraduate Students	N/A	140	100	22.70 (5.29)	Experimental	MCR	N/A	4/5

ID	Study	Country	Participant	OCD diagnostic/ severity measure M(SD)	N	Female %	Mean Age (SD)	Study design	Measure of MC	MC Mean (SD)	MMAT Score
18	Rachman et al. 2012	Canada	Undergraduate Students	N/A	S1:39 S2:40 S3:40 S4:40	S1:0 S2:0 S3:0 S4:0	S1: 20.36 (1.63) S2: 20.63 (2.93) S3: 21.53 (4.95) S4: 22.75 (5.45)	Experimental	Likert Scale	N/A	3/5
19	Elliott & Radomsky, 2013	Canada	Undergraduate Students	N/A	59	100	21.59 (4.01)	Experimental	MCR	N/A	5/5
20	Ishikawa et al. 2014a.	Japan	Undergraduate Students	N/A	48	100	18.36 (2.31)	Experimental	MCR	N/A	2/5
21	Waller & Boschen, 2015	Australia	Undergraduate Students	N/A	80	100	23.72. (9.93)	Experimental	MCR	N/A	3/5
22	Millar et al. 2016	UK	University students & employees	N/A	80	100	21.56 (4.79)	Experimental	VOCI-MC MCR	7.21 (7.65)	3/5
23	Kennedy & Simonds, 2017	UK	University students	N/A	60	0	Range: 18 - 40	Experimental	VAS	N/A	3/5
Alternative Methods of Evoking Mental Contamination											
24	Lee et al. 2013	UK	Undergraduate students	N/A	60	83.3	22.25 (8.22)	Experimental	VOCI-MC	CCC:12 (9.90) MCC:12.03 (9.07)	4/5
25	Piper, 2013	UK	Community sample G1: Mental Moral condition G2: Mental Physical condition	NA	G1: 81 G2: 99	G1:72 G2: 74	G1: 18-65 G2: 18-69	Experimental	VOCI-MC VAS	NR N/A	5/5
26	Coughtrey et al. 2014a.	UK	S1: Undergraduate students S2: Students $\geq$ 10 on VOCI-MC	N/A	S1: 40 S2: 60	70	S1: 22.60 (5.33) S2: 20.53 (4.30)	Experimental	S1: VAS S2: VOCI-MC	S1: N/A S2: 18.7 (7.89)	S1: 5/5 S2: 2/5
27	Ishikawa et al. 2015	Japan	Undergraduate students	N/A	148	100	18.45 (1.51)	Experimental	MCR	N/A	4/5

ID	Study	Country	Participant	OCD diagnostic/ severity measure M(SD)	N	Female %	Mean Age (SD)	Study design	Measure of MC	MC Mean (SD)	MMAT Score
28	Fergus & Rowart, 2018	USA	Undergraduate students	N/A	320	72.2	19.1 (1.2)	Experimental	MCR	N/A	5/5
29	Khan & Grisham, 2018	Australia	Undergraduate students top 30% CSS of PI-WSUR	N/A	119	72.6	20.11 (2.65)	Experimental	PANAS	N/A	5/5
30	Krause et al., 2020	Canada	Undergraduate students	N/A	626	88.8	22.54 (4.51)	Cross-sectional	VOCI-MC	10.71 (12.64)	5/5
31	Krause & Radomsky, 2021	Canada	Undergraduate students	N/A	149	100	22.86 (4.90)	Experimental	VOCI-MC	37.06 (13.67)	3/5
The Relationship between Mental Contamination and Disgust											
32	Carraresi et al. 2013	Italy	Previous OCD diagnosis	DOCS M(SD):NR	83	45	32.6 (9.6)	Cross-sectional	VOCI-MC	19.8 (16.8)	4/5
33	Melli et al. 2014	Italy	Formal OCD diagnosis	ADIS-IV	63	49.2	33.4 (10.3)	Cross-sectional	VOCI-MC	25.1 (17.4)	5/5
34	Travis & Fergus, 2015	USA	Mechanical Turk Online community	N/A	478	58.8	33.5 (12.5)	Cross-sectional	VOCI-MC	11.58 (12.44)	3/5
35	Melli et al. 2017	Italy	Formal OCD diagnosis	ADIS-IV	169	39.9	32.49 (10.04)	Cross-sectional	VOCI-MC	18.07 (16.30)	5/5
36	Ojserkis et al. 2018	USA	G1:Undergraduates Trauma-exposed G2: Undergraduates PTSD	OCI-R G1:20.21(12.75) G2:28.51(2.50)	G1:250 G2:49	G1:71.2 G2:79.6	G1: 20.38 (2.79) G2: 20.16 (2.00)	Cross-sectional	VOCI-MC	G1:14.49(12.12) G2:21.94 (17.59)	5/5
37	Zanjani, 2018	Iran	University Students	N/A	391	72.89	21 (4.01)	Cross-sectional	VOCI-MC	6.09 (0.47)	4/5
38	Poli et al. 2019 (S:1 excluded)	Italy	S2: Formal OCD diagnosis	ADIS-IV	103	42.7	32.3 (0.7)	Cross-sectional	VOCI-MC	18.74 (17.03)	5/5
39	Fong & Sündermann, 2020	Singapore	University Students	N/A	90	100	19.86 (1.29)	Experimental	VOCI-MC	24.15 (13.32)	4/5

ID	Study	Country	Participant	OCD diagnostic/ severity measure M(SD)	N	Female %	Mean Age (SD)	Study design	Measure of MC	MC Mean (SD)	MMAT Score
40	Inozu et al. 2021	Turkey	Undergraduate Students	N/A	174	100	20.28 (1.86)	Experimental	MCR	N/A	2/5
The Relationship between Mental Contamination and Religiosity											
41	Berman et al. 2012	USA	Undergraduate students	N/A	264	72.5	19.46 (2.75)	Cross-sectional	MPQ	MPQ-W: 5.85 (3.46) MPQ-I: 11.23 (6.45)	4/5
42	Fergus, 2014	USA	Mechanical Turk Online community G1: Catholic G2: Protestant	N/A	G1:102 G2: 128	G1: 61.8 G2: 60.9	G1: 35.7 (11.6) G2: 38.8 (13.2)	Cross-sectional	VOCI-MC	G1: 12.50 (13.27) G2: 12.43 (12.75)	5/5
43	Bileki & Inozu, 2018	Turkey	Undergraduate students G:1 High religiosity G2: Low religiosity	N/A	G1: 48 G2: 44	100	G1: 20.38 (1.5) G2: 20.82 (1.85)	Experimental	MCR	N/A	4/5
Measurement and Assessment of Mental Contamination in OCD											
44	Cougle et al. 2008	USA	S1: Undergraduates S2: Undergraduates S3: University students	N/A N/A N/A	S1: 208 S2: 257 S3: 84	S1: 61 S2: 72.5 S3: 75.3	S1: 19.45 (5.3) S2: 19.45 (5.3) S3: 19.45 (5.3)	Cross-sectional	MPQ	MPQ-W: 6.45 (4.1) MPQ-I: 11.72 (6.4)	4/5
45	Coughtrey et al. 2013a	UK	G1:Formal OCD diagnosis G2: University students	ADIS-IV	G1: 45 G2: 45	G1: 73.3 G2: 71.1	G1:34.29(10.85) G2: 22.31 (5.08)	Cross-sectional	VOCI-MC	NR	4/5
46	Ishikawa et al. 2014b	Japan	S1: Undergraduates S2: Undergraduates	N/A N/A	S1: 202 S2: 236	S1: 48.5 S2: 68.64	S1: 19.15 (.86) S2: 20.81 (4.42)	Cross-sectional	MPQ-J	MPQ-W:6.74 (3.70) MPQ-I: 11.90 (5.39)	5/5

ID	Study	Country	Participant	OCD diagnostic/ severity measure M(SD)	N	Female %	Mean Age (SD)	Study design	Measure of MC	MC Mean (SD)	MMAT Score
47	Radomsky et al. 2014	Canada	G1:Formal OCD diagnosis contamination G2:Formal OCD diagnosis non-contamination G3: Anxious control G4: Undergraduates	G1: ADIS-IV G2: ADIS-IV G3: ADIS-IV G4: Na	G1: 30 G2: 27 G3: 24 G4: 410	G1: 56.7 G2: 44.4 G3: 62.5 G4: 86.3	G1: 36.13 (10.99) G2: 43.81 (14.86) G3: 38.13 (14.45) G4: 22.45 (4.48)	Cross-sectional	VOCI-MC	G1: 30.57 (19.29) G2: 15.85 (19.17) G3: 14.13 (15.92) G4: 8.34 (9.64)	4/5
48	Melli et al. 2015	Italy	G1:Formal OCD diagnosis contamination G2:Formal OCD diagnosis non-contamination G3: Anxious control G4: Undergraduates	G1: ADIS-IV G2: ADIS-IV G3: ADIS-IV G4: Na	G1: 39 G2: 81 G3: 31 G4: 541	G1: 44 G2: 38 G3: 58 G4: 62	G1: 33.71 (9.64) G2: 31.83 (9.85) G3:34.48(12.65) G4:36.04(14.78)	Cross-sectional	VOCI-MC	G1: 32.56 (17.09) G2: 12.40 (11.45) G3: 5.77 (6.77) G4: 5.34 (7.51)	5/5
49	Zysk et al. 2016	UK	G1: Undergraduate & community participants G2: Self-report OCD	G1: OCI-R $\leq$21 G2: OCI-R $\geq$21	G1: 760 G2: 140	G1: 84.4 G2:68.6	G1: 29.35 (9.89) G2:33.62(11.63)	Cross-sectional	VOCI-MC	NR	5/5
50	Inozu et al. 2016	Turkey	University students	Na	225	81.3	Range: 18 – 28	Cross-sectional	VOCI-MC	NR	3/5
10	Pagdin et al. 2021 (Study 1)	UK	S1: University students & community participants	Na	S1: 217	89.3	S1: 35.32 (9.08)	Cross-sectional	N/A	N/A	3/5
Treatment of Mental Contamination in OCD											
51	Volz & Heyman, 2007	UK	Formal OCD diagnosis	CY-BOCS	9	11.1	14.9 (1.96)	Case series	N/A	N/A	2/4
52	Warnock-Parkes et al. 2012	UK	Formal OCD diagnosis	Y-BOCS Pre: 35 Post: 7 6mth F/U: 8	1	0	40s	Single Case	VOCI-MC	Pre:38 Post: 28 3mth F/U: 18 6mth F/U: 29	2/4

ID	Study	Country	Participant	OCD diagnostic/ severity measure M(SD)	N	Female %	Mean Age (SD)	Study design	Measure of MC	MC Mean (SD)	MMAT Score
53	Coughtrey et al. 2013b	UK	Formal OCD diagnosis	ADIS-IV Y-BOCS Pre: 28. 92 (3.42) Post: 13.25 (13.5) 3mth F/U (*n* = 8): 4.63 (9.09) 6mth F/U (*n* = 7): 1.86 (1.57)	12	58.3	28.83 (8.54)	Case series	VOCI-MC	Pre: 57.92 (15.49) Post: 23.25 (29.1) 3mth F/U (*n* = 8): 13.00 (25.22) 6mth F/U (*n* = 7): 6.43 (3.15)	5/5
54	Monzani et al. 2015	UK	Formal OCD diagnosis G1: With transformation obsessions G2: No transformation obsessions	NR CY-BOCS: G1 Pre: 27.49 (5.38) Gp1 Post: 16.5 (NR) G2 Pre: 26.28 (5.62) G2 Post: 13.8 (NR)	G1 Pre: 35 G1 Post: 28 G2 Pre: 311 G2 Post: 188	G1: 25.7 G2:47.6	G1: 14.71 (1.90) G2: 14.33 (2.25)	Observational Cohort study/ Case series	Na	Na	3/5
55	MohamadArip et al. 2018	Malaysia	Previous OCD diagnosis	Y-BOCS Pre: 39 Post: 15	1	100	27	Single Case	Na	Na	1/4
56	Zysk et al. 2018b	UK	Formal OCD diagnosis	ADIS-IV Y-BOCS Baseline: 31 Pre: 27 Post: 20 F/U: 14	1	0	20's	Single Case	MFQ Baseline:29 Pre: 28 Post: 3 F/U: 1	VOCI-MC Baseline: 59 Pre: 56 Post: 13 F/U: 37	5/5
57	Mathes et al. 2019	USA	Undergraduate students w VOCI $\geq$21 (contamination subscale)	MINI	88	72.2	19.03 (1.79)	Experimental	VOCI-MC	Pre: 39.95 (18.04) Post: 32.17(16.8) 2-week F/U: 26.17 (17.94)	4/5
58	Wadkins & Gordon, 2019	USA	Previous OCD diagnosis	NR	1	100	8	Single Case	NR	NR	3 /4

Note. ADIS-IV: Anxiety Disorders Interview Schedule; CCC = Contact Contamination Condition; CSS of PI-WSUR = Contamination symptom subscale of the Padua Inventory – Washington State University Revision (Burns et al., 1996); CYBOCS = Children's Yale-Brown Obsessive Compulsive Inventory (Scahill et al., 1997); DOCS = Dimensional Obsessive-Compulsive Scale (Abramowitz et al. 2010); F/U = Follow Up; G1 = Group 1; G2 = Group 2; G3 = Group 3; G4 = Group 4; MCC = Mental Contamination Condition; M = Mean; MCR = Mental Contamination Report; MFQ = Morphing Fear Questionnaire; MPQ = Mental Pollution Questionnaire; MPQ-J = Mental Pollution Questionnaire – Japanese version; MPQ-W = Mental Pollution Questionnaire - Washing, MPQ-I = Mental Pollution Questionnaire – Ideation; MMAT = Mixed Methods Assessment Tool; MINI = Mini International Neuropsychiatric Interview (Sheehan et al., 1998); N/A = Not applicable; Na = Not assessed; NR = Not reported; OCI = Obsessive Compulsive Inventory; OCI - R = Obsessive Compulsive Inventory- Revised; PANAS = The Positive and Negative Affect Scale (Watson et al., 1988); SD = Standard Deviation; S1 = Study 1; S2 = Study 2; VOCI-MC = Vancouver Obsessional Compulsive Inventory – Mental Contamination Scale; Y-BOCS= Yale-Brown Obsessive Compulsive Inventory.

The Role of Mental Contamination in OCD

Phenomenology of MC in OCD.

Eleven reports including a total of *N* = 12 studies investigated phenomenological aspects of MC in OCD (Coughtrey et al., 2012a, 2012b, 2014b, 2015, 2018; Firmin, 2018; Jacoby et al., 2018; Zysk et al., 2018a; Ojerkis, 2020; Pagdin et al, 2021; Howkins et al., 2021). All studies were rated as high quality, apart from one study which utilised a mixed methods design and fell in the low-quality category.

Prevalence, Comorbidity and Subtypes of Mental Contamination.

Phenomenologically, MC is experienced as a distressing feeling of widespread dirtiness accompanied by the need to wash, is located internally and is predominantly associated with a human source that is associated with a range of neutralising and avoidance behaviours (Coughtrey et al., 2012b). MC is more common than originally thought and is a distinct but overlapping construct with contact contamination (CC) (Coughtrey et al, 2012b). Unsurprisingly Jacoby et al. (2018) reported a relationship between CC and MC in a student sample. Additionally, OCD subtypes of symmetry/incompleteness and MC were associated with cognitive domains of responsibility for harm, contamination thought-action-fusion and overestimation of threat. Precipitating events for MC often involve direct experiences of immoral acts where the individual was the victim or perpetrator and potentially highlights the role of associative learning (Zysk et al., 2018a).

MC has been shown to be associated with a range of psychopathology including symptoms of eating disorders, depression, anxiety, perfectionism, low self-esteem and fear of compassion, but was most strongly associated with OCD (Coughtrey et al., 2018). In a large study of undergraduate students (*N* = 626), MC mediated the relationship between feared self-perceptions and contact contamination (Krause et al., 2020).

Rachman (2006) proposed that MC can be divided into different subtypes, one of which is the fear of morphing. Three studies have investigated the phenomenology of the fear of acquiring the undesired characteristics of another or transforming into someone or something else (e.g., an animal, such as a rat) (Monzani et al., 2015; Volz & Heyman, 2007; Zysk et al., 2018b). Transformation obsessions may not be as rare in paediatric OCD as first thought, with 10% of young people referred for specialist OCD treatment reporting transformation obsessions and being more likely to be male (Monzani et al., 2015). It is suggested that this phenomenon may be best conceptualised as being related to 'forbidden' obsessions rather than contamination (Monzani et al., 2015). In a case series, only two out of the nine young people with transformation obsessions presented with washing or cleaning compulsions (Volz & Heyman, 2007). There is a dearth of evidence on morphing in adults which prevents even tentative conclusions regarding the relationship to broader OCD.

The Relationship between Betrayal/ Interpersonal Trauma, MC and OCD.

Two studies utilising clinical samples investigated the link between MC and betrayal sensitivity (i.e., how sensitive one is to experiences of betrayal and the subsequent negative impact) (Pagdin et al., 2021; Howkins et al., 2021) and ones sensitivity to betraying others (Howkins et al., 2021). Individuals with higher levels of MC OCD were found to be more sensitive to both betrayal and betraying others, in comparison to those with low levels of MC OCD, depressed and non-clinical controls. There was no difference between groups with regards to self-reported experiences of betrayal, thus the clinical differences may be due to other factors potentially the type and extent of betrayal (Howkins et al., 2021). Other studies examined the role of bullying as a form of betrayal (Firmin, 2018) and interpersonal trauma (Ojserkis et al., 2020) as a potential connection to MC. Unfortunately, in both instances methodological limitations may have contributed to either the inability to test for or report a

relationship between betrayal, trauma and MC. However, continuing to examine a potential relationship remains worthy of investigation.

Imagery and the spread of MC.

In a series of studies, Coughtrey and colleagues examined the role of imagery and spread in MC and OCD. In samples of contamination-based OCD, images were reported as remarkably stable, lasting for years, distressing and provoked emotions including anxiety, fear, sadness, anger, guilt and shame. The images were experienced as vivid and difficult to dismiss and evoked a sense of dirtiness and the urge to wash/clean to prevent the spread of contamination (Coughtrey et al., 2015). A minority of people experienced beneficial images that neutralised feelings of contamination (Coughtrey et al., 2013). Coughtrey (2014a;b) triggered an episode of MC to examine spread and reported that 72% of participants physically spread contamination to a previously clean item and 48% did so without physical contact and in both instances the spread occurred without degradation compared to the severity of the original contaminant.

Experimental Studies

Twenty-eight experimental studies examined the role of MC in OCD, all of which utilised student or analogue populations. Of these studies 52% were rated high quality and 48% medium quality. Twenty-four studies focused on the experimental induction and manipulation of MC. One examined the induction and treatment of MC (Mathes et al., 2019). Eight studies looked at the role of disgust and OCD, of which two were experimental (Fong & Sündermann, 2020; Inozu et al., 2021), and three investigated the relationship between MC and religiosity, of which one was experimental (Bileki & Inozu, 2018).

The Experimental Induction of MC.

The "Dirty Kiss" Paradigm

Thirteen reports detailed *N* =16 experimental studies that used the "dirty kiss" paradigm to induce MC in non-clinical student populations (Fairbrother et al., 2005; Herba, 2005; Herba & Rachman, 2007; Elliott & Radomsky, 2009, 2012, 2013; Radomsky & Elliot, 2009; Rachman et al., 2012; Ishikawa et al., 2014; Millar et al., 2016; Waller & Boschen, 2015; Kennedy & Simonds, 2017; Fong & Sündermann, 2020: discussed in disgust section). Of these studies 31% were rated high quality and the remaining 69% were rated as medium quality. Of the *n* = 11 studies that randomised participants only one study specified the method of randomisation and three specified if the assessor had been blinded to the randomised condition.

In the initial experiment using the dirty kiss paradigm (Fairbrother et al., 2005) female students were asked to listen to an audiotape describing a scenario of a female receiving either a consensual or non-consensual kiss at a party. When asked to vividly imagine the scenario themselves, participants who imagined receiving a non-consensual kiss reported greater subjective feelings of dirtiness and urges to wash compared to participants asked to imagine a consensual kiss. In a replication of this study, female student participants who imagined a non-consensual kiss were more likely to spontaneously wash their mouths or gargle in an attempt to remove feelings of internal dirtiness than participants who imagined a consensual kiss (Herba, 2005). Extensions of these original studies developed the paradigm further to include an aspect of betrayal and have adapted the scenario to make it suitable for use with male participants. Results to date have shown similar findings: imagining being kissed non-consensually results in increases in self-reported feelings of internal dirtiness, urge to wash and actual washing behaviour, especially when participants are asked to imagine the female victim to be their best friend's younger sister (Elliott & Radomsky, 2009; Rachman et al., 2012). Furthermore, urge to wash and self-reported feelings of dirtiness following imagining a non-consensual kiss can be predicted by symptoms of contact contamination fear and appraisals of the event related to violation, morality, dirtiness, and personal responsibility (Elliott &

Radomsky, 2013; Radomsky & Elliott, 2009; Herba & Rachman, 2007; Kennedy & Simonds, 2017). Such experimental inductions of MC have allowed researchers to examine the impact of washing and other neutralising behaviours on the feelings of internal dirtiness. Initial experiments suggest that the feelings of induced MC are likely to be transient, declining after five minutes of washing or simply sitting and waiting post imagining a non-consensual kiss (Ishikawa et al., 2014).

These early experiments concluded that betrayal and moral violations may play a key role in MC in OCD. However, the paradigm is limited in that it involves asking participants to vividly imagine elements of contact contamination and bodily fluids. In an attempt to disentangle the elements of CC and MC, later manipulations of the dirty kiss paradigm were adapted to include imagining receiving a non-consensual and consensual kiss from men described as physically dirty. This manipulation demonstrated that MC can be evoked from imagined physical dirt in the absence of immoral behaviour (Elliott & Radomsky, 2012, 2013). Furthermore, the paradigm was adapted to compare imagined betrayals, utilising an imagined non-consensual kiss and an imagined theft. This manipulation indicated that imagined physical contact but not imagined betrayal, was important in evoking feelings of MC (Millar et al., 2016).

The majority of experiments have used the dirty kiss paradigm to evoke feelings of MC as the victim of a perceived betrayal or immoral event. However, three studies have used an adapted version to explore the impact of violating one's own moral standards (Kennedy & Simonds, 2017; Rachman et al., 2012; Waller & Boschen, 2015). Male student participants experienced feelings of MC similar to those induced in the original studies when they were asked to imagine being the perpetrator in the scenario, i.e., kissing someone without their consent (Rachman et al., 2012). Similar findings were found in a sample of undergraduate females asked to imagine kissing a 14-year-old boy without consent (Waller & Boschen, 2015).

Although there is an obvious confound with physical contact in the non-consensual kiss paradigm, collectively the findings of these studies suggest that people experience feelings of MC both as a victim and as a perpetrator of a physical violation, and that these feelings can be evoked simply by imagining a hypothetical event.

Alternative Methods of Evoking MC.

In response to the criticism that imagining physical contact and bodily fluids may create a confound with the experience of feelings of contact contamination, eight reports detailed *N* = 9 studies that used alternative methods to experimentally evoke feelings of MC in non-clinical populations (Coughtrey et al., 2014a; 2014b; Fergus & Rowatt, 2018; Khan & Grisham, 2018; Krause & Radomsky, 2021; Lee et al., 2013; Mathes et al., 2019; Piper, 2013). Of these studies the majority (78%) were rated as high quality and the remaining 22% were rated of medium quality.

In an attempt to disentangle bodily fluid fears from perceived violation, Krause and Radomsky (2021) asked female students to imagine a workplace sexual harassment scenario with manipulations of personal responsibility. Participants in all conditions reported significant increases in dirtiness, anxiety and disgust after imagining sexual harassment. This finding suggests that imagining a less extreme form of violation than a non-consensual kiss and without the confound of imagining the physical exchange of saliva, was sufficient to produce feelings of MC (Krause & Radomsky, 2021).

A number of experimental studies highlight the role of morality and the interconnection between MC and CC. For instance, recounting memories of coming into contact with something physically disgusting or recalling a behaviour that was inconsistent with morals or ethics resulted in feeling of dirtiness, feelings of contamination, shame and disgust but was not accompanied by an increase in anxiety or urge to wash (Piper, 2013). Fergus and Rowatt (2018) evoked MC utilizing a thought action fusion induction task (imagine wishing a loved one would

be in a car accident and critical care). Khan & Grisham (2018) reported that participants who were asked to recall immoral autobiographical memories were more likely to complete word fragments to form washing related words. Similarly, non-clinical participants were asked to recall autobiographical memories or images associated with betrayal, harm, humiliation, and violation of moral standards or to imagine wearing a sweater that belonged to someone who was known to be very immoral, or a hat that had belonged to an alcoholic. These inductions resulted in significant increases in MC, anxiety, urges to wash and actual washing behaviour (Coughtrey et al., 2014a). The evoked feelings of MC spontaneously decayed within a few minutes, unless the feelings were repeatedly re-evoked or the participant was asked to engage in repeated washing behaviour (Coughtrey et al., 2014a). In a comparison of contact and MC inductions, student participants were asked to either imagine moving a bucket of vomit, or to physically move a bucket of fake vomit. Both manipulations induced feelings of contamination, although those participants who physically moved the bucket of fake vomit reported significantly greater urges to wash (Lee et al., 2013). More recently, a study of students with elevated symptoms of OCD, some of whom met diagnostic criteria for OCD, found that imagining a bowl of vomit was sufficient to evoke feelings of MC and that this then resulted in increased fear following a contact contamination exposure (Mathes et al., 2019). Whilst these experiments demonstrated that imagined contamination fears are sufficient to evoke feelings of dirtiness, the obvious confound with bodily fluids remains. Additionally, the interrelationship between MC and CC requires additional investigation.

The Relationship between MC and Disgust.

The role of disgust in OCD has been widely investigated and more recently the research focus has expanded to explore the relationship between MC and disgust. Nine studies in this review explicitly examined the interplay between MC, disgust and OCD (Carraresi et al., 2013; Fong & Sündermann, 2020; Inozu et al., 2021; Melli et al., 2014; Melli et al., 2017; Poli et al.,

2019; Travis & Fergus, 2015; Ojserkis et al., 2018; Zanjani et al., 2018). Of these studies 87.5% were rated high quality and 12.5% medium quality.

Studies of clinical samples with OCD have demonstrated that MC mediates the relationship between disgust propensity and fear of contamination (Carraresi et al., 2013) and washing behaviour (Melli et al., 2014; Zanjani et al., 2018) particularly when contamination fears are based on disgust avoidance (Melli et al., 2017). Similarly, Fong and Sündermann, (2020) reported enhanced feeling of dirtiness when an MC induction was completed in the context of a disgusting smelling environment compared to a a neutral or pleasant smell.

In two cross-sectional studies disgust sensitivity was found to potentiate the effect of disgust propensity on MC, indicating that MC was stronger in people with both high disgust sensitivity and disgust propensity in a community sample (Travis & Fergus, 2015) and a trauma-exposed sample (Ojserkis et al., 2018). Analyses of the dirty- kiss paradigm found that disgust propensity and contamination thought-action-fusion predicted disgust sensitivity, and that MC mediated the relationship between disgust sensitivity and urge to wash (Inozu et al., 2021).

The differential roles of various forms of disgust in both mental and contact contamination have also been investigated. A measure of sexual disgust was a unique predictor of MC in a clinical sample of participants with OCD, whilst a measure of pathogen disgust was a predictor of contact contamination. Interestingly, in this study, moral disgust was not associated with either form of contamination fear (Poli et al., 2019).

The Relationship between MC and Religiosity.

The strength of religious beliefs or religiosity has been demonstrated to be positively associated with OCD (e.g., Abramowitz et al., 2004; Sica et al., 2002). Religiosity is therefore postulated to be particularly relevant in cases of MC-based OCD where immorality and guilt is hypothesised to play a pivotal role. Three studies have examined the relationship between MC and religiosity and have found mixed results (Berman et al., 2012; Bilekli & Inozu, 2018;

Fergus, 2014). All three of these studies were rated as high in quality. Bilekli & Inozu, 2018 reported a relationship between MC and high religiosity in a group of Muslim women whereas Berman et al, 2012 reported no relationship between religiosity and MC in a group of mainly Catholics and Protestants.

The relationship between religiosity and MC may instead be due to a strong association between MC and scrupulosity (Abramowitz et al., 2002). In a large sample of working adults (N = 230) who self-identified as Catholic or Protestant, MC was positively correlated with scrupulosity, even when controlling for dysfunctional beliefs, CC, religiosity and negative affect (Fergus, 2014).

Measurement of Mental Contamination

Eight reports detail N = 11 studies on the development and psychometric validation of seven self-report measures developed to assess MC and related constructs in adults (Cougle et al. 2008; Coughtrey et al. 2013a; Ishikawa et al. 2014a; Radomsky et al. 2014; Melli et al. 2015; Zysk et al. 2016; Inozu et al. 2016; Pagdin et al. 2021). Of these studies 75% were assessed as high quality and 25% medium quality (See Table 7S for detailed summary of psychometric properties).

Two self-report measures of MC have been developed, the first is the Mental Pollution Questionnaire (MPQ) (Cougle et al., 2008) used in N = 2 included studies. The MPQ has been translated into Japanese and validated within a Japanese sample (Ishikawa et al., 2014). The second is the Vancouver Obsessional Compulsive Inventory - Mental Contamination Scale (VOCI-MC) (Rachman, 2005a). The VOCI-MC is the most widely used, employed in N = 27 of the included studies. A score of $\geq$ 40 is indicative of clinical levels of MC (Radomsky et al., 2014). The VOCI-MC has been translated and validated in Turkish (Inozu et al., 2016) and Italian. However, in the Italian version a VOCI-MC score of >18 indicates clinically significant

MC (Melli et al., 2014). The validation of the VOCI-MC in clinical groups has further demonstrated that MC is a coherent construct that is measurable (Radomsky et al., 2014), as previous measures of contamination had focused only on CC.

With regards to other types of MC and related constructs five additional self-report measures have been developed. The Morphing Fear Questionnaire (MFQ) (Zysk et al., 2016) assesses the presence and severity of morphing beliefs. The Contamination Sensitivity Scale (CSS) (Rachman, 2005b) assesses the degree to which an individual may become distressed by feelings of contamination, while the Contamination Thought-Action Fusion Scale (C-TAF) (Rachman, 2005c) assesses the fusion between thoughts, feelings and behaviours associated with contamination. The C-TAF has been translated and validated in a Turkish sample (Inozu et al., 2016). The Mental Contamination Imagery Questionnaire (MCIQ) (Coughtrey et al., 2013) assesses dimensions of imagery related to MC and the Perceptions of Betrayal Scale (POBS) (Pagdin et al., 2021) assesses sensitivity to betrayal. Taken together, a range of valid and reliable measures of MC and related constructs in adults are now freely available. Some measures (i.e., VOCI-MC; CSS) are able to discriminate between contamination-based OCD and other forms of OCD, making them useful in both research and clinical settings, assisting clinicians to identify MC more easily and thus guide therapeutic priorities and interventions.

Assessment of Mental Contamination

Five of the treatment focused studies made recommendations for the assessment of MC in clinical practice (Coughtrey et al. 2013b; Warnock-Parkes et al. 2012; Zysk et al., 2018a; Volz & Heyman, 2007; Monzani et al., 2015). There was consensus amongst reports that a detailed assessment is required to gain a thorough understanding of the main presenting problem, its history, and onset with a focus on aspects pertinent to MC. It is recommended that all sources of contamination, both mental and contact be identified and to establish if there is

overlap. Questions about the meaning that contamination holds for the individual, their view on how MC spreads and what may trigger MC and/or morphing fears, with the therapist holding in mind the possibility of MC being triggered by perpetrators as well as victims, is important.

Taking a history that includes previous violations, betrayals and emotional reactions to such and questions about morality are also recommended. Enquiring about the use of imagery, including protective imagery is also advised. The use of questionnaires may be instrumental in clinical assessment, not only for identifying such beliefs, but also for normalising their occurrence. It was noted particularly in paediatric OCD, that young people may find MC obsessions embarrassing or a sign that they are 'deluded' making them reluctant and fearful of disclosing such (Volz & Heyman, 2007; Monzani et al., 2015). To date, however, there are no established MC measures for use with young people.

The Treatment of Mental Contamination

Eight of the included studies examined Cognitive Behavioural approaches to the treatment of MC in OCD. Five focused on the treatment of adults (Warnock-Parkes et al. 2012; Coughtrey et al. 2013b; MohamadArip et al. 2018; Zysk et al. 2018b; Mathes et al. 2019) and three with young people (Volz & Heyman, 2007; Monzani et al. 2015; Wadkins & Gordon, 2019). The quality of the treatment studies with adults was varied with n = 3 rated as high quality, n =1 medium quality and n =1 low quality. All three of the paediatric studies were rated as medium quality.

The Treatment of MC in Adults

To date three studies have utilised a modified version of CBT for OCD to specifically target MC. CBT for MC adopts a predominantly cognitive focus, utilising behavioural experiments and integrating imagery work (including protective imagery) to address appraisals of key events that precipitate feelings of MC. A retrospective single case study

(Warnock-Parkes et al., 2012) and a prospectively designed case series (*N* = 12) (Coughtrey et al., 2013b) have utilised this approach, which was delivered by two or more experienced therapists. The third study, a prospective single case of a patient with morphing fears, used a similar approach with the additional focus of building a robust sense of self, delivered by a single experienced therapist (Zysk et al., 2018b).

Coughtrey et al (2013b) reported that seven of the 12 participants demonstrated a complete recovery from OCD with gains maintained at both 3- and 6-month follow-up. Nine participants demonstrated clinically significant reductions in MC, also maintained at follow-up. In both of the case studies the individuals made clinically significant gains. Additionally, Zysk et al. (2018b) reported that the patient was no longer reporting morphing fears and had developed a more robust sense of self by the end of treatment and maintained at follow-up. However, separate MC fears had not significantly improved, suggesting that morphing fears and MC may not be inextricable.

Two studies employed a predominantly Exposure and Response Prevention (ERP) approach (Mathes et al., 2019; MohamadArip et al., 2018). In a sample of female undergraduate students with elevated OC symptoms (*N* = 88) (of whom *N* = 44 met OCD diagnostic criteria) Mathes et al. (2019) reported significant decreases in both MC and CC at the end of treatment and maintained at 2- week follow up. However, the authors note that the overall findings indicate that pre-treatment levels of MC may be associated with poorer treatment outcomes. In addition, the study findings also provided support for MC and CC being related but distinct constructs, with changes in self-report measures occurring independently of each other (Mathes et al., 2019). MohamadArip et al. (2018) completed a single case of acute onset MC using ERP augmented with religious content. It was associated with significant pre-post YBOCS decline. Unfortunately, the authors did not use a measure of MC.

The Treatment of MC in young people

Three studies focused on the provision of treatment for young people. Two reported retrospective case series of young people who were referred to a UK national specialist paediatric OCD service and received treatment for transformation obsessions (Monzani et al., 2015; Volz & Heymen, 2007). One study described treatment for a young person with MC (Wadkins & Gordon, 2019). Exposure and response prevention was used in each instance and reported to be effective. However, drawing conclusions about the ability to treat MC in youth is limited by the lack of MC-specific dependent measures for this age group. Additionally, each of the included studies exhibited methodological limitations that prevent further exploration of the interplay between MC and CC and broader OCD.

Discussion

This systematic review synthesised the growing literature on MC in OCD. It aimed to understand what is known about the phenomenology of MC in OCD, the existing experimental evidence, and methods to measure and assess the construct. Finally, it aimed to examine the best methods of treatment. Taken together, the literature showed MC to be a central construct in OCD, closely related to physical contamination. The existing experimental evidence demonstrated that there are multiple ways to determine the impact of increasing or decreasing MC on other symptoms of OCD, as well as cognitions and behaviour. Clinical, subclinical and non-clinical studies supported the close relationship between MC and other forms of OCD. The studies demonstrated that far from being a rare, unusual form of OCD as might have originally been hypothesised, it was surprisingly common (up to 46% in participants with clinically elevated symptoms of OCD; Coughtrey et al., 2012). Although particularly intertwined with CC, the studies showed that MC was also associated with a broad range of OCD, other psychopathology and psychological constructs such as self-perception. Furthermore, MC tends

to behave in the same way as other forms of OCD, notably being associated with imagery and having magical properties such as spreading by contagion.

The original concept of MC (Rachman, 2004, 2006) proposed that there were different manifestations of MC including visual contamination, self-contamination and morphing. Although the review revealed some studies on morphing ('transformation obsessions'), the literature has not followed the original conceptual distinctions between the different forms of MC. Instead, the focus has been on the triggers of MC, including trauma and, notably, the role of betrayal. This review suggests that it is perceived sensitivity to, rather than objective experiences of, betrayal that is associated with MC.

The work on the phenomenology of MC and its close relationship with other forms of OCD and psychopathology begs the question of how MC could have been overlooked for so long. The cognitive theory of obsessions (Rachman, 1997) focused on appraisals of intrusions such as 'I am mad', 'I am bad', and 'I am dangerous' and MC is likely to elicit each of these. As such, disclosing MC may be particularly frightening and stigmatising. The experimental research that began with the 'dirty kiss' experiment and became increasingly refined, is consistent with the experience of MC as anxiety-provoking and closely related to contact contamination. Indeed, many of the studies have relied on imagination of contact contamination, violation and betrayal to elicit MC. The consistent finding that MC can reliably be elicited under laboratory conditions speaks to our increased understanding of factors that provoke MC and range from cognitive biases, autobiographical memories and sexual harassment.

One of the most striking findings to emerge from this review is that MC is closely, and likely reciprocally, related to multiple forms of disgust and that the impact of MC induction on disgust is influenced by the scent of the room (let that be a lesson to all of us!). There is a longstanding and wide literature on disgust, including fascinating work on the relationship

between disgust and morality in which gustatory disgust influences moral judgement (Eskine et al., 2011). Bringing such literature and learning to bear on MC is likely to facilitate its improved understanding and treatment and could usefully be incorporated into measures of assessment.

Assessment and measurement of MC in OCD has proven remarkably straightforward and consistent across research groups. The development and validation of seven self-report measures (two of MC and five on closely related constructs) has further demonstrated the robustness of the construct of MC and provided standardised tools for assessing related phenomena important in clinical assessment and treatment. A measures of MC should be included as standard in OCD assessments, with the benefits of identifying, normalising and potentially guiding treatment priorities, which may be particularly advantageous for patients who have not previously been helped by CBT with ERP for OCD. Careful consideration of complimentary measures of overall OCD symptom severity may be useful for clinicians, as MC may influence the perpetuation of symptoms if a sense of internal dirtiness remains, despite apparent improvements related to CC (Mathes et al., 2019). A measure that assesses symptoms based on time engaged in obsessions/ compulsions, avoidance as well as distress and impairment caused (e.g., DOCS; Abramowitz et al. 2010) will ensure the full picture is captured with regards to treatment progress and outcome. A dearth of commensurate measures for paediatric OCD makes the above difficult to apply to young people, with a need for the development of appropriate measures, to address this gap.

Undoubtedly considerable progress has been made in understanding the phenomenology and in the measurement of MC. However, this progress has not led to similar strides forward in the treatment of MC. What we do know from the largest treatment study (Coughtrey et al., 2013b) is that MC is amenable with a relatively short term cognitive-focused

treatment. This treatment package includes understanding the triggers and their relationship to experiences of contamination, cognitive reappraisal of the triggers, introducing a modicum of flexibility around morals using behavioural experiments, hypothesis testing and identification/normalising a wide variety of emotions and distinguishing them from contamination. Subsequent single case studies (e.g., Zysk et al., 2018b) have also demonstrated that a subtype of MC, morphing, is amenable to this same cognitively-focused treatment which emphasized the stability of self in addition to components discussed above. Moving forward, the development and testing of a treatment protocol with larger samples is needed.

ERP has long been utilized to treat OCD contamination and presumably MC. However, because MC was only recently identified, it is unclear the extent to which ERP is effective in ameliorating MC, particularly when it is not overlapping with CC. The treatment outcome studies done to date specifically involving ERP to treat MC have methodological limitations that prevent definitive conclusions. The inclusion of MC measures in future ERP treatment outcome studies would be helpful and may lead to disentangling the relationship between CC and MC and the ability for behavioural treatments to effectively address MC. Additionally it may be some combination of cognitive and behavioural treatments that may be the most effective in treating this complex presentation.

Future research on MC is needed to continue the important work that has benefited from Professor Radomsky's expert investigation. Adam has continued the rich tradition of developing free, widely accessible assessment instruments to help clinicians establish the presence of MC and designing experiments that can be used therapeutically. His work on MC is just one example of his enormous contribution to the field. It is not just 'Importance' that is important in clinical research – it is observation, compassion, academic expertise and the ability to see the 'big picture'. Working closely with Professor Radomsky (and sharing humour

related to carrots) has been a pleasure throughout the decades, and his future work in the field of MC and beyond will undoubtedly be both original and impactful.

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*indicates included papers

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Supplementary Material to: The Current Status of Mental Contamination in Obsessive Compulsive Disorder: A Systematic Review

Table 1S

PRISMA 2020 checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			Page #
Title	1	Identify the report as a systematic review.	1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	2 - 3
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	3
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	4
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	5
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	6 and Sup. Material p. 5
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	6
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	6
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	5 - 6
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	5
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	6-7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	N/A
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	7
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	N/A

Section and Topic	Item #	Checklist item	Location where item is reported
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	7
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	N/A
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/A
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	N/A
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	N/A
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	N/A
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	7 - 8
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Sup. Material p. 7-9
Study characteristics	17	Cite each included study and present its characteristics.	11 - 18
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	11 – 18
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	N/A
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	19 - 31
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	N/A
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/A
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	N/A
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/A
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	N/A
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	31 - 36
	23b	Discuss any limitations of the evidence included in the review.	35

Section and Topic	Item #	Checklist item	Location where item is reported
	23c	Discuss any limitations of the review processes used.	35
	23d	Discuss implications of the results for practice, policy, and future research.	35 – 36
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	4
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	4
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	N/A
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	1
Competing interests	26	Declare any competing interests of review authors.	1
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	-

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/

Details pertinent to Electronic searches.

We conducted an electronic literature search of PsycINFO (APA PsycNET), EMBASE, Medline and The Cochrane Library (including the Cochrane Central Register of Controlled Trials (CENTRAL)) for articles published between 1990 and June 2021. The year 1990 was chosen to be inclusive of time surrounding the first publication using the term Mental Pollution (Rachman, 1994).

Searches were initially run in November 2020 and updated in June 2021. We used theses.com, EThos and ProQuest to search for theses.

ResearchGate and google scholar was used to search for the full text of theses that were not available via the abovementioned platforms, and to contact authors to request full text of required papers and theses.

Table 2S

Search Strategy

Source	Search Strategy
Electronic Database: PsychINFO	**Accessed via**: APA PsychNET **Fields:** keywords[2,3] and abstract **Date:** 1990 to June 2021 1.Keywords: OCD OR obsessi* OR compulsi* 2.Abstract: OCD OR obsessi* OR compulsi* 3.Keywords: mental contamination OR mental pollution OR transform* obsession 4.Abstract: mental contamination OR mental pollution OR transform* obsession 5. 1 AND 2 6. 3 AND 4 7. 5 AND 6
Electronic Databases: Embase, Medline	**Accessed via:** Embase.com **Quick limits:** Human **Fields:** descriptor (/de), Abstract (ab), title (ab), Keyword (kw) **Date:** 1990 to June 2021 1. 'obsessive compulsive disorder'/de 2. obsessi*:ti,ab,kw 3. compulsi*:ti,ab,kw 4. OCD:ti,ab,kw) 5. 1 OR 2 OR 3 OR 4 6. ‘mental contamination’/de

	7. mental AND pollution:ti,ab,kw 8. transform AND obsession ti,ab,kw 9. 6 OR 7 OR 8 10. 5 AND 9
Existing Reviews Cochrane Library	**Field:** Topic **Date:**1990 to June 2021 OCD OR Obsessive Compulsive Disorder AND Mental contamination OR mental pollution OR transformation obsession OR morphing
Trial Registry Cochrane Central Register of Controlled Trials	**Field:** Condition **Date:** 1990 to June 2021 OCD OR obsessi* OR compulsi* OR Obsessive-Compulsive Disorder AND Mental contamination OR mental pollution OR transformation obsession OR morphing
Theses/ dissertations: ProQuest EThos Theses.com	**Field:** Any word **Date:** 1990 to June 2021 1. obsessive compulsive disorder AND mental contamination 2. obsessive compulsive disorder AND mental pollution 3. obsessive compulsive disorder AND morphing 4. obsessive compulsive disorder AND transformation obsessions 5. obsessive compulsive disorder AND 'dirty kiss'
Conference Abstracts: PsychExtracts	**Accessed via**: APA PsychNET **Fields:** keywords[2,3] and abstract **Date:** 1990 to June 2021 1.Keywords: OCD OR obsessi* OR compulsi* 2.Abstract: OCD OR obsessi* OR compulsi* 3.Keywords: mental contamination OR mental pollution OR transform* obsession 4.Abstract: mental contamination OR mental pollution OR transform* obsession 5. 1 AND 2 6. 3 AND 4 7. 5 AND 6
Conference Abstracts: Conference Proceedings Citation Index - Science (CPCI-S)	**Field:** Topic Heading **Date:** 1990 to June 2021 (OCD OR obsessi* OR compulsi* OR Obsessive Compulsive Disorder OR OCD) AND (Mental contamination OR mental pollution OR transformation obsession OR morphing)
Reference lists of included papers	Hand-searched by title

Table 3S

Reason for Exclusion at Full Text Review

ID	Author, Year	Title	Reason for Exclusion
1	Rachman, 1994	Pollution of the mind	Theoretical/ conceptual paper
2	Tallis, 1996	Compulsive washing in the absence of phobic and illness anxiety	MC is not the focus
3	Fairbrother & Rachman, 2004	Feelings of mental pollution subsequent to sexual assault	Focus not related to OCD
4	Rachman, 2004	Fear of Contamination	Theoretical/ conceptual paper
5	Nelson, 2005	Mental pollution and inflated responsibility in Obsessive-Compulsive Disorder: The contribution of anxiety, disgust, and guilt	Unable to source full text of dissertation
6	Deacon & Olatunji, 2007	Specificity of disgust sensitivity in the prediction of behavioral avoidance in contamination fear	MC is not the focus
7	Hevia, 2009	Emotional contamination: A lesser-known subtype of OCD.	Unable to source full text
8	Brady et al. 2010	Disgust in contamination-based obsessive-compulsive disorder: A review and model	MC is not the focus
9	Cisler et al. 2010	Disgust and Obsessive Beliefs in Contamination-Related OCD	MC is not the focus
10	Rachman, 2010	Betrayal: A Psychological Analysis	Theoretical/ conceptual paper
11	Pallanti et al. 2011	Disgust, passive-avoidance and treatment response in OCD	MC is not the focus
12	Belova, 2012	Inbored disgust propensity in the aspect of the development of pathological personality	English translation not available

ID	Author, Year	Title	Reason for Exclusion
13	Belova & Koliutskaia, 2012	["Moral mysophobia" phenomenon in schizophrenia]	English translation not available
14	Kwok, 2012	Mental contamination: A replication and extension of the "dirty kiss" experiment	Unable to source full text of dissertation
15	Badour et al. 2013	Disgust, Mental Contamination and Post-Traumatic Stress: Unique relations following sexual versus non-sexual assault.	OCD is not the focus
16	Rachman, 2013	Anxiety, 3rd ed	Book chapter
17	Adams et al. 2014	Contamination aversion and posttraumatic stress symptom severity following sexual trauma	Focus not related to OCD
18	García-Soriano et al. 2016	Psychopathology of washing compulsions in obsessive-compulsive disorder: Not all patients wash for the same reasons	English translation not available
19	Zanjani et al. 2016	Factor Structure and Psychometric Properties of the Persian Version of Vancouver Obsessional Compulsive Inventory–Mental Contamination Scale (VOCI-MC).	English translation not available for full text
20	De Putter et al. 2017	Obsessions and compulsions in the lab: A meta-analysis of procedures to induce symptoms of obsessive-compulsive disorder	MC is not the focus
21	Ojserkis, 2017	Examining the unique roles of disgust constructs in co-occurring posttraumatic stress and obsessive-compulsive symptoms	Unable to source full text of dissertation
22	Blakey & Jacoby, 2018	The polluted mind: Understanding mental contamination as a transdiagnostic phenomenon	Theoretical/ conceptual paper

ID	Author, Year	Title	Reason for Exclusion
23	Brennen et al. 2018	A case of severe intractable contamination-based obsessive-compulsive disorder	MC is not the focus
24	Gilchrist & Schnall, 2018	The paradox of moral cleansing: when physical cleansing leads to increased contamination concerns	MC is not the experimental focus
25	Iwasa, 2018	Factor structure, reliability, and validity of the Japanese version of the Disgust Scale-Revised (DS-R-J). [Factor structure, reliability, and validity of the Japanese version of the Disgust Scale-Revised (DS-R-J).]	MC is not the focus
26	Radomsky et al. 2018	Abnormal and normal mental contamination	Theoretical/ conceptual paper
27	Kumari, 2019	Mental Contamination in Obsessive Compulsive Disorder: An Explorative Study (Doctoral dissertation, Central Institute of Psychiatry (India)).	Unable to source full text of dissertation
28	Kumari et al. 2019	Mental contamination, feelings of disgust and thought-action fusion in persons with contamination OCD	Paper not published at available citation: Indian Journal of Psychiatry Vol. 61, No. 9, pp. S595-S595
29	Rickelt et al. 2019	Emotional processing and disgust sensitivity in OCD patients with and without contamination-type obsessive-compulsive symptoms – An fMRI study	MC is not the focus
30	Shafran et al. 2019	Implementing Cognitive Behavioural Therapy to Treat a Fear of Morphing in Obsessive Compulsive Disorder.	Book Chapter
31	Giraldo-O'Meara & Radomsky, 2020	Cognitive therapy for mental contamination and scrupulosity in obsessive compulsive disorder	Conference presentation – could not obtain full text

Note: MC = Mental Contamination; OCD = Obsessive Compulsive Disorder

Table 4S

Data Extracted for each included study

Category	Information extracted
Method	Study design, publication date, country, single or multi-site, duration of study, setting (outpatient/inpatient/experimental).
Participants	Total number, mean age and standard deviation, sex, ethnicity, diagnostic criteria, method of diagnosis, comorbidity, OCD symptom severity, and treatment history (e.g., previous CBT treatment failure present/absent).
Intervention & Comparators	Type of intervention, total number of intervention groups (for each intervention and comparison group), Intervention details (i.e., therapy duration, session duration, therapy hours per week/total), duration/ frequency of experimental/ control conditions. Total number of intervention groups. Integrity of intervention.
Outcome	Outcomes and time points (i) collected; (ii) reported, measures used (primary and secondary), change in OCD severity pre-post-and follow-up scores, participant completion versus attrition, and use of intention to treat analysis. For scales: upper and lower limits, and whether high or low score is good. Number of participants allocated to each intervention group. For each outcome of interest: sample size, missing participants, summary data for each intervention group.
Miscellaneous	Funding source, Key conclusions of the study authors, notable conflicts of interest.

Table 5S

Application of Quality Assessment Mixed Methods Appraisal Tool

Assessment of Risk of Bias in Included Studies
The Mixed Methods Appraisal tool (MMAT) (Hong et al., 2018) was used to assess the quality of included studies. The MMAT is a single integrated tool which is designed to assess quantitative, qualitative and mixed methods studies. The initial stage of the assessment involves two screening questions; 1. Is there a clear research question? and 2. Do the data collected address this research question? Methodological quality criteria is then assessed under 1 of 5 research design categories as specified by the MMAT. Each category has 5 assessment criteria and the outcome of whether each criteria has been met is indicated by a response of either 'Yes', 'No' or 'can't tell'. Each record was given an overall assessment of 'quality' summary score. The summary score is represented as a fraction indicating the number of criteria definitely met (i.e., each criteria scored as 'yes') out of the number of criteria assessed (i.e., 5 or 4 if one criterion was excluded due to not being applicable based on study design). Studies that definitely met 80-100% of criteria were deemed 'high', 40-60% 'medium' and $\leq$ 20% 'low' quality. All records were independently rated by two reviewers (JM & EH/SS), and discrepancies were resolved by discussion between the reviewers.

Table 5.1S *Phenomenology of MC – Individual Quality Assessment Ratings using the Mixed Methods Appraisal Tool (MMAT)*

Reviewer	First author	Year	Citation	SCREENING		1. QUALITATIVE STUDIES					4. QUANTITATIVE DESCRIPTIVE STUDIES					5. MIXED METHODS STUDIES				
				S1. Are there clear research questions?	S2. Do the collected data allow to address the research questions?	1.1. Is the qualitative approach appropriate to answer the research question?	1.2. Are the qualitative data collection methods adequate to address the research question?	1.3. Are the findings adequately derived from the data?	1.4. Is the interpretation of results sufficiently substantiated by data?	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	4.1. Is the sampling strategy relevant to address the research question?	4.2. Is the sample representative of the target population?	4.3. Are the measurements appropriate?	4.4. Is the risk of nonresponse bias low?	4.5. Is the statistical analysis appropriate to answer the research question?	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?	5.2. Are the different components of the study effectively integrated to answer the research question?	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?
Phenemonology of Mental Contamination in OCD																				
EH	Coughtrey	2012 a.	Mental contamination in obsessive–compulsive disorder	Yes	Yes						Yes	Yes	No	No	Yes					
JM	Coughtrey	2012 a.		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
Consensus	Coughtrey	2012 a.		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
EH	Coughtrey	2012 b.	It's the feeling inside my head: A qualitative Analysis of Mental Contamination in OCD	Yes	Yes	Yes	Yes	Yes	Yes	Yes										
JM	Coughtrey	2012 b.		Yes	Yes	Yes	Yes	Yes	Yes	Yes										
Consensus	Coughtrey	2012 b.		Yes	Yes	Yes	Yes	Yes	Yes	Yes										
EH	Coughtrey	2014b.	The spread of mental contamination	Yes	Yes						Yes	Yes	Yes	Yes	Yes					
JM	Coughtrey	2014b.		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
Consensus	Coughtrey	2014b.		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
EH	Coughtrey	2015	Imagery in Mental Contamination	Yes	Yes	Yes	Yes	Yes	Yes	Yes										
JM	Coughtrey	2015		Yes	Yes	Yes	Yes	Yes	Yes	Yes										
Consensus	Coughtrey	2015		Yes	Yes	Yes	Yes	Yes	Yes	Yes										
EH	Coughtrey	2018	Mental contamination: Relationship with psychopathology and	Yes	Yes						Yes	Yes	Yes	No	Yes					
JM	Coughtrey	2018		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
Consensus	Coughtrey	2018		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
SS	Firmin	2018	Theoretical and Clinical Investigation into the Concept of Mental Contamination in Relation to OCD and	Yes	Yes											Can't tell	Can't tell	Can't tell	Can't tell	Can't tell
JM	Firmin	2018		Yes	Yes											Yes	No	Can't tell	No	Can't tell
Consensus	Firmin	2018		Yes	Yes											Yes	No	Can't tell	Can't tell	Can't tell
EH	Jacoby	2018	Mental contamination obsessions: An examination across the	Yes	Yes						Can't tell	No	Yes	Can't tell	Yes					
JM	Jacoby	2018		Yes	Yes						Can't tell	Yes	Yes	Yes	Yes					
Consensus	Jacoby	2018		Yes	Yes						Can't tell	Yes	Yes	Yes	Yes					
EH	Zysk	2018	The origins of mental contamination	Yes	Yes						Yes	Yes	Yes	Can't tell	Yes					
JM	Zysk	2018		Yes	Yes						Yes	Yes	Yes	Can't tell	Yes					
Consensus	Zysk	2018		Yes	Yes						Yes	Yes	Yes	Can't tell	Yes					
EH	Ojserkis	2020	Obsessive-compulsive symptom profiles in individuals exposed to	Yes	Yes						Yes	Can't tell	Yes	Can't tell	Yes					
JM	Ojserkis	2020		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
Consensus	Ojserkis	2020		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
SS	Pagdin	2020	'I was treated like dirt': evaluating links between betrayal and mental	Yes	Yes						Yes	Yes	Yes	Yes	Yes					
JM	Pagdin	2020		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
Consensus:Study 2	Pagdin	2020		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
SS	Howkins	2021	Sensitivity to being betrayed and betraying others in obsessive compulsive disorder and depression	Yes	Yes						Yes	Yes	Yes	Yes	Yes					
JM	Howkins	2021		Yes	Yes						Yes	Yes	Yes	Yes	Yes					
Consensus	Howkins	2021		Yes	Yes						Yes	Yes	Yes	Yes	Yes					

Table 5.2S

The Experimental Induction of MC: The Dirty Kiss Paradigm – Individual Quality Assessment Ratings using the MMAT

Reviewer	First author	Year	Citation	SCREENING QUESTIONS		2. RANDOMIZED CONTROLLED TRIALS					3. NON-RANDOMIZED STUDIES					4. QUANTITATIVE DESCRIPTIVE STUDIES				
				S1. Are there clear research questions?	S2. Do the collected data allow to address the research questions?	2.1 Is randomization appropriately performed?	2.2 Are the groups comparable at baseline?	2.3 Are there complete outcome data?	2.4 Are outcome assessors blinded to the intervention provided?	2.5 Did the participants adhere to the assigned intervention?	3.1. Are the participants representative of the target population?	3.2. Are measurements appropriate regarding both the outcome and intervention?	3.3. Are there complete outcome data?	3.4. Are the confounders accounted for in the design and analysis?	3.5. During the study period, is the intervention administered as intended?	4.1. Is the sampling strategy relevant to address the research question?	4.2. Is the sample representative of the target population?	4.3. Are the measurements appropriate?	4.4. Is the risk of nonresponse bias low?	4.5. Is the statistical analysis appropriate to answer the research question?
The Experimental Induction of Mental Contamination: The "Dirty Kiss" Paradigm																				
EH	Fairbrother	2005	Mental pollution: feelings of	No	Yes	Yes	Yes	Yes	Can't tell	Yes										
JM	Fairbrother	2005	dirtiness without physcial	Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
Consensus	Fairbrother	2005		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
SS	Herba	2005	Individual differences in	Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
JM	Herba	2005	psychological feelsings of	Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
Consensus	Herba	2005		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
EH	Herba	2007	Vulnerability to mental	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes										
JM	Herba	2007	contamination	Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
Consensus	Herba	2007		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
EH	Elliot	2009	Analyses of mental	No	Yes	Yes	Yes	Yes	Can't tell	Yes										
JM	Elliot	2009	contamination: Part I,	Yes	Yes	Can't tell	Yes	Yes	Yes	Yes										
Consensus	Elliot	2009		Yes	Yes	Can't tell	Yes	Yes	Yes	Yes										
SS	Radomsky	2009	Analyses of mental contamination: Part II, individual differences	No	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
JM	Radomsky	2009		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
Consensus	Radomsky	2009		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
EH	Elliot	2012	Mental contamination: The	No	Yes	Yes	Yes	Yes	Yes	Yes										
JM	Elliot	2012	effects of imagined physical dirt and immoral behaviour	Yes	Yes	Can't tell	Yes	Yes	Yes	Yes										
Consensus	Elliot	2012		Yes	Yes	Can't tell	Yes	Yes	Yes	Yes										
SS	Rachman	2012	Mental contamination: The	Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
JM	Rachman	2012	perpetrator effect	Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
Consensus	Rachman	2012		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
EH	Elliot	2013	Meaning and mental	Yes	Yes											Can't tell	No	Yes	Can't tell	Yes
JM	Elliot	2013	contamination: Focus on	Yes	Yes											Yes	Yes	Yes	Yes	Yes
Consensus	Elliot	2013		Yes	Yes											Yes	Yes	Yes	Yes	Yes
SS	Ishikawa	2014b.	Comparing the roles of	Yes	Yes						Yes	Yes	No	Can't tell	Can't tell					
JM	Ishikawa	2014b.	washing and non-washing	Yes	Yes						Yes	Yes	Can't tell	Can't tell	Can't tell					
Consensus	Ishikawa	2014b.		Yes	Yes						Yes	Yes	Can't tell	Can't tell	Can't tell					
SS	Waller	2015	Evoking and reducing mental	Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
JM	Waller	2015	contamination in female	Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
Consensus	Waller	2015		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
EH	Millar	2016	Mental contaminationinthe	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes										
JM	Millar	2016	"dirty kiss": Imaginal betrayal	Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
Consensus	Millar	2016		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
SS	Kennedy	2017	Does modifying personal	Yes	Yes	No	Yes	Yes	No	Yes										
JM	Kennedy	2017	responsibility moderate the	Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										
Consensus	Kennedy	2017		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes										

Table 5.3S

Alternative Methods of Evoking MC– Individual Quality Assessment Ratings using the MMAT

Reviewer	First author	Year	Citation	SCREENING		2. RANDOMIZED CONTROLLED TRIALS					4. QUANTITATIVE DESCRIPTIVE STUDIES				
				S1. Are there clear research questions?	S2. Do the collected data allow to address the research questions?	2.1 Is randomization appropriately performed?	2.2 Are the groups comparable at baseline?	2.3 Are there complete outcome data?	2.4 Are outcome assessors blinded to the intervention provided?	2.5 Did the participants adhere to the assigned intervention?	4.1 Is the sampling strategy relevant to address the research question?	4.2 Is the sample representative of the target population?	4.3 Are the measurements appropriate?	4.4 Is the risk of nonresponse bias low?	4.5 Is the statistical analysis appropriate to answer the research question?
Alternative methods of evoking mental contamination															
EH	Lee	2013	The induction of mental and contact contamination	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes					
JM	Lee	2013		Yes	Yes	Yes	Yes	Yes	Can't tell	Yes					
Consensus	Lee	2013		Yes	Yes	Yes	Yes	Yes	Can't tell	Yes					
SS	Piper	2013	An experimental study of mental contamination: the role of disgust, shame	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
JM	Piper	2013		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Consensus	Piper	2013		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
EH	Coughtrey	2014a.	The spontaneous decay and persistence of mental contamination: A experimental STUDY 1	Yes	Yes						Yes	Yes	Yes	No	Yes
JM	Coughtrey	2014a.		Yes	Yes						Yes	Yes	Yes	Yes	Yes
Consensus	Coughtrey	2014a.		Yes	Yes						Yes	Yes	Yes	Yes	Yes
SS	Coughtrey	2014a.	The spontaneous decay and persistence of mental contamination: A experimental STUDY 2	Yes	Yes	Can't tell	Yes	Can't tell	Can't tell	Yes					
JM	Coughtrey	2014a.		Yes	Yes	Can't tell	Yes	Can't tell	Can't tell	Yes					
Consensus	Coughtrey	2014a.		Yes	Yes	Can't tell	Yes	Can't tell	Can't tell	Yes					
EH	Ishikawa	2015	Unwanted Sexual Experiences and Cognitive Appraisals That Evoke Mental Contamination	Yes	Yes						Yes	No	Yes	Can't tell	Yes
JM	Ishikawa	2015		Yes	Yes						Yes	Yes	Yes	Yes	Yes
Consensus	Ishikawa	2015		Yes	Yes						Yes	Yes	Yes	Yes	Yes
EH	Fergus	2018	Examining associations between thought-action fusion and state mental contamination following an in vivo thought induction task	Yes	Yes						Can't tell	Yes	Yes	Can't tell	Yes
JM	Fergus	2018		Yes	Yes						Can't tell	Yes	Yes	Yes	Yes
Consensus	Fergus	2018		Yes	Yes						Can't tell	Yes	Yes	Yes	Yes
EH	Khan	2018	Wiping your conscience clean: Investgating the Macbeth effect in individuals with high	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes					
JM	Khan	2018		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Consensus	Khan	2018		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
EH	Krause	2020	It's not so much about what you touch: Mental contamination mediates the	Yes	Yes						Yes	No	Yes	Can't tell	Yes
JM	Krause	2020		Yes	Yes						Yes	Yes	Yes	Yes	Yes
Consensus	Krause	2020		Yes	Yes						Yes	Yes	Yes	Yes	Yes
SS	Krause 2021	2021	"Was I asking for it?": An experimental investigation of perceived responsibility,	Yes	Yes	Yes	No	Yes	Can't tell	Yes					
JM	Krause 2021	2021		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes					
Consensus	Krause 2021	2021		Yes	Yes	Can't tell	Yes	Yes	Can't tell	Yes					

Table 5.4S

The Relationship between MC and Disgust / Religiosity – Individual Quality Assessment Ratings using the MMA

Reviewer	First author	Year	Citation	SCREENING		2. RANDOMIZED CONTROLLED TRIALS					4. QUANTITATIVE DESCRIPTIVE STUDIES				
				S1. Are there clear research questions?	S2. Do the collected data allow to address the research questions?	2.1 Is randomization appropriately performed?	2.2 Are the groups comparable at baseline?	2.3 Are there complete outcome data?	2.4 Are outcome assessors blinded to the intervention provided?	2.5 Did the participants adhere to the assigned intervention ?	4.1 Is the sampling strategy relevant to address the research question?	4.2 Is the sample representative of the target population?	4.3 Are the measurements appropriate?	4.4 Is the risk of nonresponse bias low?	4.5 Is the statistical analysis appropriate to answer the research question?
The Relationship Between Mental Contamination and Disgust.															
EH	Carraresi	2013	Mental contamination in OCD: Its role in the relationship between digust and disgust propensity and fear of contamination	Yes	Yes						Yes	Yes	Yes	Can't tell	Yes
JM	Carraresi	2013		Yes	Yes						Yes	Yes	Yes	Can't tell	Yes
Consensus	Carraresi	2013		Yes	Yes						Yes	Yes	Yes	Can't tell	Yes
EH	Melli	2014	Disgust propensity and contamination-related OCD symptoms: The mediating role of mental contamination	Yes	Yes						Yes	Yes	Yes	Can't tell	Yes
JM	Melli	2014		Yes	Yes						Yes	Yes	Yes	Yes	Yes
Consensus	Melli	2014		Yes	Yes						Yes	Yes	Yes	Yes	Yes
EH	Travis	2015	The potentiating effect of disgust sensitivity on the relationship be- tween disgust propensity and mental contamination	No	Can't tell						Yes	No	Yes	Can't tell	Yes
JM	Travis	2015		No	Can't tell						Yes	Can't tell	Yes	Yes	Yes
Consensus	Travis	2015		No	Can't tell						Yes				Yes
EH	Melli	2017	The differential relationship between mental contamination and the core dimensions of contact contamination fear	Yes	Yes						Yes	Yes	Yes	No	Yes
JM	Melli	2017		Yes	Yes						Yes	Yes	Yes	Yes	Yes
Consensus	Melli	2017		Yes	Yes						Yes	Yes	Yes	Yes	Yes
JM	Ojserkis	2018	Associations between MC, disgust & OC symptoms in the context of trauma	Yes	Yes						Yes	Yes	Yes	Yes	Yes
SS	Ojserkis	2018		Yes	Yes						Yes	Yes	Yes	Yes	Yes
Consensus	Ojserkis	2018		Yes	Yes						Yes	Yes	Yes	Yes	Yes
EH	Zanjani	2018	A Structural Model of Relationship Between Disgust Propensity and Fear of Contamination: The Mediating Role of Mental Contamination	Yes	Yes						Yes	No	Yes	Can't tell	Yes
JM	Zanjani	2018		Yes	Yes						Yes	No	Yes	Yes	Yes
Consensus	Zanjani	2018		Yes	Yes						Yes	No	Yes	Yes	Yes
EH	Poli	2019	Different Disgust Domains Specifically Relate to Mental and Contact Contamination Fear in Obsessive-Compulsive Disorder: Evidence From a Path Analytic Model in an Italian Clinical Sample	Yes	Yes						No	Yes	Yes	No	Yes
JM	Poli	2019		Yes	Yes						Yes	Yes	Yes	Yes	Yes
Consensus	Poli	2019		Yes	Yes						Yes	Yes	Yes	Yes	Yes
EH	Fong	2020	Modulating disgust in mental contamination: Experimental evidence for the role of disgust	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes					
JM	Fong	2020		Yes	Yes	Yes	Yes	Yes	Can't tell	Yes					
Consensus	Fong	2020		Yes	Yes	Yes	Yes	Yes	Can't tell	Yes					
EH	Inozu	2021	contamination-related thought-action fusion in mental contamination-related washing urges	Yes	Yes						Can't tell	Yes	Yes	Can't tell	Yes
JM	Inozu	2021		Yes	Yes						Can't tell	Can't tell	Yes	Can't tell	Yes
Consensus	Inozu	2021		Yes	Yes						Can't tell	Can't tell	Yes	Can't tell	Yes
The relationship between mental contamination and religiosity															
EH	Berman	2012	Predictors of mental pollution: The contribution of religion, parenting strategies, and childhood trauma	Yes	Yes						Yes	No	Yes	Can't tell	Yes
JM	Berman	2012		Yes	Yes						Yes	Yes	Yes	Can't tell	Yes
Consensus	Berman	2012		Yes	Yes						Yes	Yes	Yes	Can't tell	Yes
EH	Fergus	2014	Mental contamination and scrupulosity: Evidence of unique associations between Catholics and Protestants	Yes	Yes						Yes	Yes	Yes	Can't tell	Yes
JM	Fergus	2014		Yes	Yes						Yes	Yes	Yes	Yes	Yes
Consensus	Fergus	2014		Yes	Yes						Yes	Yes	Yes	Yes	Yes

Table 5.5S

Assessment and Measurement of MC– Individual Quality Assessment Ratings using the MMAT

Reviewer	First author	Year	Citation	SCREENING QUESTIONS		4. QUANTITATIVE DESCRIPTIVE STUDIES				
				S1. Are there clear research questions?	S2. Do the collected data allow to address the research questions?	4.1. Is the sampling strategy relevant to address the research question?	4.2. Is the sample representative of the target population?	4.3. Are the measurements appropriate?	4.4. Is the risk of nonresponse bias low?	4.5. Is the statistical analysis appropriate to answer the research question?
Assessment & Measurement of Mental Contamination										
EH	Cougle	2008	An exploration of the relationship between mental	No	Yes	Yes	Yes	Yes	Can't tell	Yes
JM	Cougle	2008		Yes	Yes	Yes	Yes	Yes	Can't tell	Yes
Consensus	Cougle	2008		Yes	Yes	Yes	Yes	Yes	Can't tell	Yes
EH	Coughtrey	2013	Imagery in mental contamination: A questionnaire	Yes	Yes	Yes	Yes	Yes	No	Yes
JM	Coughtrey	2013		Yes	Yes	Yes	Yes	Yes	Can't tell	Yes
Consensus	Coughtrey	2013		Yes	Yes	Yes	Yes	Yes	Can't tell	Yes
EH	Ishikawa	2014a.	Developing a Japanese version of the mental pollution questionnaire and examining the cognitions that contribute to	Yes	Yes	Yes	Can't tell	Yes	Can't tell	Yes
JM	Ishikawa	2014a.		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Consensus	Ishikawa	2014a.		Yes	Yes	Yes	Yes	Yes	Yes	Yes
EH	Radomsky	2014	The nature and assessment of mental contamination: A psychometric analysis	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes
JM	Radomsky	2014		Yes	Yes	Yes	Yes	Yes	Can't tell	Yes
Consensus	Radomsky	2014		Yes	Yes	Yes	Yes	Yes	Can't tell	Yes
EH	Melli	2015	Factor structure and temporal stability of the Vancouver	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes
JM	Melli	2015		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Consensus	Melli	2015		Yes	Yes	Yes	Yes	Yes	Yes	Yes
EH	Zysk	2016	Development and Validation of the Morphing Fear	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes
JM	Zysk	2016		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Consensus	Zysk	2016		Yes	Yes	Yes	Yes	Yes	Yes	Yes
EH	Inozu	2016	The relationship between OCD and MC: psychometric	No	Yes	Can't tell	Yes	Yes	Yes	Yes
JM	Inozu	2016		No	Yes	Can't tell	Yes	Yes	Can't tell	Yes
Consensus	Inozu	2016		No	Yes	Can't tell	Yes	Yes	Can't tell	Yes
EH	Pagdin	2021	'I was treated like dirt': evaluating links between	Yes	Yes	No	No	Yes	Can't tell	Yes
JM	Pagdin	2021		Yes	Yes	Yes	No	Yes	No	Yes
Consensus	Pagdin	2021	STUDY 1	Yes	Yes	Yes	No	Yes	No	Yes

Table 5.6S

Treatment of MC– Individual Quality Assessment Ratings using the MMAT

Reviewer	First author	Year	Citation	SCREENING		3. NON-RANDOMIZED STUDIES					4. QUANTITATIVE DESCRIPTIVE STUDIES				
				S1. Are there clear research questions?	S2. Do the collected data allow to address the research questions?	3.1. Are the participants representative of the target population?	3.2. Are measurements appropriate regarding both the outcome and intervention?	3.3. Are there complete outcome data?	3.4. Are the confounders accounted for in the design and analysis?	3.5. During the study period, is the intervention administered as intended?	4.1. Is the sampling strategy relevant to address the research question?	4.2. Is the sample representative of the target population?	4.3. Are the measurements appropriate?	4.4. Is the risk of nonresponse bias low?	4.5. Is the statistical analysis appropriate to answer the research question?
Treatment of Mental Contamination															
EH	Volz	2007	Case Series: Transformation Obsession	No	Can't tell						No	No	Can't tell	Can't tell	
JM	Volz	2007	in Young People With Obsessive-Compulsive Disorder (OCD)	No	Can't tell						Can't tell	Yes	Yes	Can't tell	
Consensus	Volz	2007	Case Series: Transformation Obsession ir	No	Can't tell						Can't tell	Yes	Yes	Can't tell	
EH	Warnock-Parkes	2012	When the Problem is Beneath the Surface in OCD: The Cognitive	Yes	Can't tell						No	No	Yes	Can't tell	
JM	Warnock-	2012	Treatment of a Case of Pure Mental	Yes	Yes						Yes	Yes	Yes	Yes	
Consensus	Warnock-Parkes	2012		Yes	Yes						Yes	Yes	Yes	Yes	
SS	Coughtrey	2013b	The Treatment of Mental Contamination: A Case Series	Yes	Yes						Yes	Yes	Yes	Yes	Yes
JM	Coughtrey	2013b		Yes	Yes						Yes	Yes	Yes	Yes	Yes
Consensus	Coughtrey	2013b		Yes	Yes						Yes	Yes	Yes	Yes	Yes
SS	Monzani	2015	Transformation obsessions in paediatric obsessive-compulsive disorder: Clinical characteristics and treatment response to cognitive behaviour therapy	Yes	Yes	Yes	Yes	Can't tell	Can't tell	Yes					
JM	Monzani	2015		Yes	Yes	Yes	Yes	No	Can't tell	Yes					
Consensus	Monzani	2015		Yes	Yes	Yes	Yes	No	Can't tell	Yes					
EH	Mohamad Arip	2018	Islamic integrated exposure response therapy for mental pollution subtype of contamination obsessive-compulsive	No	Can't tell						No	Yes	No	Can't tell	
JM	Arip	2018		No	Can't tell						Can't tell	Can't tell	No	Yes	
Consensus	Mohamad Arip	2018		No	Can't tell						Can't tell	Can't tell	No	Yes	
EH	Zysk	2018	A Single-Subject Evaluation of the	Yes	Can't tell						No	No	Yes	Can't tell	Yes
JM	Zysk	2018	Treatment of Morphing Fear	Yes	Yes						Yes	Yes	Yes	Yes	Yes
Consensus	Zysk	2018		Yes	Yes						Yes	Yes	Yes	Yes	Yes
EH	Mathes	2019	Mental Contamination in Obsessive-Compulsive Disorder: Associations With	No	Yes						Yes	Yes	Yes	Can't tell	Yes
JM	Mathes	2019	Contamination Symptoms and Treatment Response	Yes	Yes						Yes	Yes	Yes	Can't tell	Yes
Consensus	Mathes	2019		Yes	Yes						Yes	Yes	Yes	Can't tell	Yes
SS	Wadkins	2019	Comorbidity, Parental Psychopathology, and Accomodation	Yes	Yes						Yes	Yes	Can't tell	Yes	
JM	Wadkins	2019	in the Treatment of paediatric OCD	Yes	Yes						Yes	Yes	Can't tell	Yes	
Consensus	Wadkins	2019		Yes	Yes						Yes	Yes	Can't tell	Yes	

Table 6S

Description of Participant Characteristics

Participants
Twenty-three studies utilised clinical samples of participants with OCD (either self-reported (*n* = 3), previously diagnosed (i.e., the participant had received a diagnosis of OCD from a general practitioner or mental health professional prior to the study) (*n* = 5) or formally diagnosed as a part of the study assessment procedure (*n* = 15)). The Anxiety Disorders Interview Schedule – IV (ADIS-IV; Brown et al., 1994) was the most widely used diagnostic tool used in included studies. The mean age of participants with OCD was *M* = 33.93 (*SD* = 2.30). Samples varied in size from *n* = 20 to 177 participants in cross-sectional studies and from *n* = 1 to 35 participants in case studies/series. Fifty-five percent of clinical samples comprised a minimum of 60% women, the remaining 45% comprised a more even split between genders. Only *n* = 4 studies provided information on participant ethnicity, all of which had predominantly White (e.g., 78-95%) samples, with *n* = 2 reporting ethnicity as a proportion of 'white' or 'other', with no further information provided.
Non-clinical student or analogue samples were used in *n* = 32 studies, with *n* = 4 studies utilising student samples with elevated OC symptoms, with some students meeting diagnostic criteria. The mean age of student/analogue participants was 20.97 (*SD* = 1.94). Samples ranged in size from 44 to 625 participants. Fifteen experimental studies comprised samples that were 100% women, and *n* = 2 were 100% male. A further *n* = 11 studies had samples between 70-80% women. Only *n* =14 studies provided information on participant ethnicity most of which reported approximately 50-60% Caucasian with much smaller divisions of other ethnicities represented included African American, Asian, Black, Chinese, Hispanic, Latino, Indian.

Table 7S

Measurement of Mental Contamination and Related Constructs

Measure	Purpose, Composition and Scoring	Psychometric properties	Translation & psychometric properties
Mental Contamination Report (MCR) Herba & Rachman, 2007	• Used in *n* = 12 of the included studies • Developed for use in experimental studies which aim to evoke and manipulate MC • In the MCR mental contamination is operationalized by three indices: 1. Ratings of dirtiness, 2. Ratings of urge to wash 3. Rinsing behaviour. • Participants are asked rate their feeling of dirtiness and urge to wash/rinse on a 5-point scale (1 = not at all to 5 = very much).	N/A	N/A
Mental Pollution Questionnaire (MPQ) Cougle et al., 2008	• Developed to measure Mental Pollution. • Eight item self-report questionnaire. • Two subscales; 1. *Washing:* Assessment of internal dirtiness that an individual may attempt to relieve through washing 2. *Ideation:* An ideational form of mental pollution that is not linked to washing. • Items rated on how much each statement is 'true of them'. 1 = Strongly disagree to 7 = Strongly agree. • Higher scores associated with greater obsessions, contamination and washing symptoms.	Cougle et al., 2008 • Internal consistency Total scale: α = .86 Washing: α = .87 Ideation: α = .85 • Test-retest reliability Total scale: *r* = .88, *p* <.0001 Washing: *r* = .*90*, *p* <.0001 Ideation: *r* = .82, *p* <.0001	**Japanese Version**: Ishukawa et al., 2014. • Internal consistency Total scale: α = .82 Washing: α = .85 Ideation: α = .84 • Test-retest reliability Total scale: *r* = .*71*, *p* <.001 Washing: *r* = .*69*, *p* <.001 Ideation: *r* = .*68*, *p* <.001
The Vancouver Obsessional Compulsive Inventory - Mental Contaminatio	• Designed to capture 'symptoms' of Mental Contamination • 20-item self-report questionnaire. • Items are rated on a 5-point Likert-scale (0 = 'not at all' to 4 = 'very much'). • Example item: "I often feel dirty inside my body"	Radomsky et al., 2014 • Internal consistency: OCD Contamination group: α = .94 OCD Non-Contamination: α = .97 Anxious Control: α = .96 Student Control: α =.93	**Italian version -** Melli et al., 2014. • Internal consistency: general population α = 92; OCD population α =.93; Other Anxiety Disorders α =. 85.

n Scale (VOCI-MC) Rachman, 2005a	• Higher scores indicate a greater level of MC symptomology. • A score of ≥ 40 is indicative of 'clinical levels of MC • Score of ≤ 10 is considered non-clinical level of MC	• Good convergent validity with the contamination subscale of the VOCI • Good divergent validity with symptoms of depression on the BDI-II • Excellent discriminant validity with the ability to discriminate between participants with OCD contamination-related concerns, those without/ as well as clinical and non-clinical controls (Radomsky et al., 2014).	• Excellent discriminant validity with the ability to discriminate between participants with OCD contamination-related concerns and all other groups of participants. • Excellent construct validity **Turkish version** Inozu et al., 2016 • Internal consistency: student population α = 93 • Test-retest reliability: *r = .79*
The Contamination Sensitivity Scale (CSS) Rachman, 2005b	• Designed to assess the degree to which an individual may become distressed by feelings of contamination • 24-item self-report questionnaire • Items are rated on a 5-point Likert scale ranging from 0 (not at all) to 4 (very much) • Higher scores indicate greater distress from contamination. • Example items: "It scares me when I feel dirty inside my body" and "If I cannot get rid of worries about contamination, I am nervous that I might be going crazy".	• Radomsky et al., 2014 • Internal consistency: OCD Contamination group: α = .90 OCD Non-Contamination: α = .94 Anxious Control: α = .91 Student Control: α =.92 • Excellent discriminant validity with the ability to discriminate between participants with OCD contamination-related concerns, those without/ as well as clinical and non-clinical controls.	
The Contamination Thought-Action Fusion Scale (CTAF) Rachman, 2005c	• Developed to assess the fusion between thoughts about contamination and feelings and behaviour associated with contamination. • 9-item self-report questionnaire • Items are rated on a 5-point Likert-type scale ranging from 0 (strongly disagree) to 4 (strongly agree). • Higher scores indicate higher levels of contamination thought-action fusion. • Example items: "If I get an image of myself being contaminated, it will make me feel contaminated" and "Having a thought that I might pass contamination onto someone else is almost as bad as actually doing it".	Radomsky et al., 2014 • Internal consistency: OCD Contamination group: α = .96 OCD Non-Contamination: α = .96 Anxious Control: α = .95 Student Control: α =.93 • Discriminant validity: able to discriminate between clinical and nonclinical groups, but not between different clinical groups.	**Turkish version** Inozu et al., 2016 • Internal consistency: student population α = 92 • Test-retest reliability: *r = .62*

Mental Contamination Imagery Questionnaire (MCIQ) Coughtrey et al. 2013	• Assessment of dimensions of imagery related to MC • 20-item self-report scale • Items rated on a five-point scale: 0 = not at all to 4 = very much. • No items are reversed scored. • The dimensions of imagery assessed include: *Image vividness:* "I have very vivid, clear images of being dirty or contaminated." *Ease of dismissal*: "I find it very hard to get rid of pictures of dirt and contamination." *Image distress*: "I find having pictures of dirt and contamination in my mind extremely distressing." *Urge to wash:* "Some pictures in my mind make me want to wash." *Field/1st person perspective:* "I picture dirt and contamination through my own eyes, as if I am actually there." *Observer/3rdpersonperspective:* "I picture dirt and contamination as if I'm watching a film of myself."	Coughtrey et al., 2013 • Inter-item reliability: OCD: α = .87 Non-Clinical: α = .85	
Morphing Fear Questionnaire (MFQ) Zysk et al., 2015	• Assessment of the presence and severity of morphing beliefs and fears • 13 item self-report measure • Items rated on the extent to which they agree, on a five-point scale 0 = Not at all to 4 = Very Much. • Example item: "I worry I can magically be transformed into someone or something else". • Respondents are asked to provide a short explanation or a specific example for any two questions with which they agree much/very much.	Zysk et al., 2015 • Internal consistency: OCD sample α = .90 good temporal stability (r = .73) • Excellent construct validity (e.g., convergence with the OCI-R and VOCI-MC, and divergence with BDI-II and BAI). • Discriminant validity in its ability to discriminate between groups reporting OCD, anxiety, depression, and no OCD.	
Perception of Betrayal Scale (POBS)	• Developed to assesses the impact of betrayal on different dimensions such as interpersonal relationships, self-perception and behaviour. • The measure has 4 factors;	Pagdin et al., 2021 • Internal consistency: community population: α = .88 - .95 • Test-retest reliability: r = .64 to .91	

Pagdin et al., 2021	1. Preoccupation with betrayal events (item example: “I find myself thinking about past acts of betrayal more than I should”) 2. Betrayal causing life change (item example: “The choices I make about my life have changed as a result of betrayals I have experienced”) 3. Lack of trust due to betrayal (item example: “It’s best not to rely on others as you never know when they’re going to let you down”) 4. Betrayal leading to traumatic responses (item example: “When I think about my experiences of betrayal, I still find it hard to believe it really happened”). • 27-item self- report questionnaire • Items rated on a five-point scale: 0 = not at all to 4 = very much.		

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