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REVIEW ARTICLE

Update on treatment studies for compulsive buying-shopping disorder: A systematic review

ASTRID MÜLLER[1*], NORA M. LASKOWSKI[1,2], TOBIAS A. THOMAS[1], STEPHANIE ANTONS[3], NADJA TAHMASSEBI[4], SABINE STEINS-LOEBER[5], MATTHIAS BRAND[3,6] and EKATERINI GEORGIADOU[1,7]

[1] Department of Psychosomatic Medicine and Psychotherapy, Hannover Medical School, Hannover, Germany

[2] Ruhr-University Bochum, University Clinic for Psychosomatic Medicine and Psychotherapy, Medical Faculty, Campus East-Westphalia, Germany

[3] General Psychology: Cognition and Center for Behavioral Addiction Research (CeBAR), University of Duisburg-Essen, Germany

[4] Salus Klinik Friedrichsdorf, Germany

[5] Department of Clinical Psychology and Psychotherapy, University of Bamberg, Germany

[6] Erwin L. Hahn Institute for Magnetic Resonance Imaging, Essen, Germany

[7] Department of Psychiatry and Psychotherapy, Paracelsus Medical University Nuremberg, Germany

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ABSTRACT

Background and aims: Compulsive buying-shopping disorder (CBSD) is mentioned as an example of other specified impulse control disorders in the ICD-11 coding tool, highlighting its clinical relevance and need for treatment. The aim of the present work was to provide a systematic update on treatment studies for CBSD, with a particular focus on online CBSD. *Method:* The preregistered systematic review (PROSPERO, CRD42021257379) was performed in accordance with the PRISMA 2020 statement. A literature search was conducted using the PubMed, Scopus, Web of Science and PsycInfo databases. Original research published between January 2000 and December 2022 was included. Risk of reporting bias was evaluated with the CONSORT guideline for randomized controlled trials. Effect sizes for primary CBSD outcomes were calculated. *Results:* Thirteen studies were included (psychotherapy: 2 open, 4 waitlist control design; medication: 2 open, 3 placebo-controlled, 2 open-label phase followed by a double-blind discontinuation phase; participants treatment/control 349/149). None of the studies addressed online CBSD. Psychotherapy studies suggest that group cognitive-behavioral therapy is effective in reducing CBSD symptoms. Pharmacological studies with selective serotonin re-uptake inhibitors or topiramate did not indicate superiority over placebo. Predictors of treatment outcome were rarely examined, mechanisms of change were not studied at all. Risk of reporting bias was high in most studies. *Discussion:* Poor methodological and low quality of reporting of included studies reduce the reliability of conclusions. There is a lack of studies targeting online CBSD. More high-quality treatment research is needed with more emphasis on the CBSD subtype and mechanisms of change.

KEYWORDS

systematic review, compulsive buying-shopping disorder, online shopping, treatment, CONSORT, PRISMA

*Corresponding author.
E-mail: mueller.astrid@mh-hannover.de

INTRODUCTION

For the first time, compulsive buying-shopping disorder (CBSD) is now listed as an example of *other specified impulse control disorders* in the coding tool of the 11th edition of the International Classification of Diseases (ICD-11 code 6C7Y) (WHO, 2022).

Phenomenological features of CBSD are time-consuming shopping activities and excessive spending of consumer items that are not needed or not utilized for the intended purposes, which may be offline (i.e. in-store) or online (i.e. on the internet) (McElroy, Keck, Pope, Smith, & Strakowski, 1994; Müller, Laskowski, Trotzke, et al., 2021). Diagnostic characteristics of CBSD include diminished control over buying/shopping (with regard to e.g., frequency, intensity, duration, and context), increasing priority given to buying/shopping to the extent that the consumer activities interfere with other interests, leisure activities, professional duties, and daily responsibilities (Black, 2022; Laskowski, Trotzke, de Zwaan, Brand, & Müller, 2021; McElroy et al., 1994; Müller, Laskowski, Trotzke, et al., 2021), harmful consequences of inappropriate buying/shopping (e.g., clinically significant distress, indebtedness, deceitful behavior, familial discord, shame, regret, embarrassment, or even legal problems) and impairment in personal, family, social, educational, occupational, or other important areas of functioning (Achtziger, Hubert, Kenning, Raab, & Reisch, 2015; Benson, 2013; McElroy et al., 1994; Müller, Laskowski, Trotzke, et al., 2021; Park, Cho, & Seo, 2006). Notwithstanding the numerous adverse consequences, the maladaptive consumer behavior is continued or even escalated. Treatment-seeking individuals with CBSD often suffer from other mental disorders, e.g., anxiety and depressive disorders, hoarding disorder (i.e., accumulation of purchased items), eating disorders marked by binge eating, and other addictive behaviors (Black, 2022; Christenson et al., 1994; Fernandez-Aranda et al., 2008; Granero et al., 2016; Müller et al., 2010).

With the growth of e-commerce, more and more people are buying/shopping on the internet, resulting in the shift from traditional offline CBSD to online CBSD (Adamczyk, 2021; Augsburger et al., 2020; Baggio et al., 2022; Duroy, Gorse, & Lejoyeux, 2014; Fineberg, Menchon, et al., 2022; Müller, Steins-Loeber, et al., 2019). Specific internet features (e.g., ubiquity, availability, anonymity, infinite scrolls) and e-marketing (e.g., e-branding, livestream shopping, specific payment options, personalized recommendations) may amplify the addictive potential of online buying/shopping (Clark & Zack, 2023). While the symptomatic pattern described above applies to both offline and online CBSD, it is not yet clear whether online CBSD should be seen as the virtual equivalent of traditional offline CBSD or, at least in a subgroup of individuals with online CBSD, as a standalone specific internet-use disorder that would not have developed in brick-and-mortar retail (Fineberg, Menchon, et al., 2022; Müller, Laskowski, Wegmann, Steins-Loeber, & Brand, 2021). It appears that online CBSD as compared to offline CBSD is associated with a higher severity of CBSD and interferes more with daily life, health, school, occupational, and social commitments due to time-consuming browsing for goods on the internet during night, school hours, working time, meetings or while one should be pursuing other daily obligations (Müller, Steins-Loeber, et al., 2019). In addition to specific internet and e-commerce features, individual expectancies and using motives may contribute to the development and maintenance of online CBSD, e.g., buying unobserved, avoiding analogue communication, getting access to huge product variety and anticipating the opportunity to satisfy an urge to buy promptly (Kukar-Kinney, Ridgway, & Monroe, 2009; Trotzke, Starcke, Müller, & Brand, 2015). Furthermore, reward and relief mechanisms known form substance use disorders and other behavioral addictions (e.g., gambling disorder) may play an important role in online CBSD as well (Brand, 2022; Brand, Young, Laier, Wölfling, & Potenza, 2016; Trotzke, Starcke, Müller, & Brand, 2019).

The mention of CBSD in ICD-11 highlights its clinical relevance. Undoubtedly, treatment is necessary for CBSD, as the problem is associated with massive negative consequences for affected persons and their relatives, impairments in important areas of functioning, and chronicity (Achtziger et al., 2015; Benson, 2013; McElroy et al., 1994; Müller, Laskowski, Trotzke, et al., 2021; Park et al., 2006). In view of the growth of e-commerce and the presumed increase in problematic or even addictive usage of shopping applications (Augsburger et al., 2020; Müller, Steins-Loeber, et al., 2019), more attention should be paid to the specifics of online CBSD that may influence therapy. It is conceivable that successful treatment of online CBSD requires an adaptation of existing therapeutic approaches for CBSD. Past systematic reviews of treatments for CBSD concluded that cognitive-behavioral psychotherapy (CBT) in the group format represents a helpful approach (Goslar, Leibetseder, Muench, Hofmann, & Laireiter, 2020; Hague, Hall, & Kellett, 2016; Leite, Pereira, Nardi, & Silva, 2014; Vasiliu, 2022), while no convincing effect was found for medication (Soares, Fernandes, & Morgado, 2016).

Previous systematic reviews have not paid attention to whether the CBSD occurred offline or online. In this work, we searched for treatment studies for CBSD that reported whether the buying/shopping environment (offline, online, mixed) was assessed and considered in the analyses. The aim was to provide a systematic update on treatment studies for online and/or offline CBSD with a focus on primary outcomes and the quality of reporting by using the Consolidated Standards of Reporting Trials (CONSORT) criteria for treatment studies of the Cochrane Collaboration (Cumpston & Chandler, 2022; Moher et al., 2012). This review scope is of relevance for clinicians and researchers because additional information on the treatment of online CBSD will inform about the availability (or lack thereof) of new or adopted treatment approaches which may optimize clinical practice and initiate future proof-of-concept and treatment studies. When we started this project, the last systematic reviews were published three (Goslar et al., 2020) to eight years ago (Leite, Pereira, et al., 2014). Our goal was in line with the recommendations for regular updates of systematic reviews of the Cochrane Collaboration (Cumpston & Chandler, 2022; Moher et al., 2008). Recently, another systematic review was published by Vasiliu (2022) that, however, differs from the current work with respect to methodological aspects such as search strategy, included articles, analysis of primary outcomes and discussion. Therefore, the current work is justified and expands on previous reviews. Taking

into account past systematic reviews (Goslar et al., 2020; Hague et al., 2016; Leite, Pereira, et al., 2014; Soares et al., 2016; Vasiliu, 2022) that found no controlled or open treatment studies for CBSD before 2000 and considering the strong increase of the e-commerce marketplace and the development of Web 2.0 technologies especially during the last two decades (VanHoose, 2011), the present systematic review focuses on treatment studies published since 2000. Due to the expected low number of publications that specifically refer to online CBSD, all available literature on treatments for CBSD was evaluated (not only literature considering particularly online CBSD) that has been published since then. Hereafter, the abbreviation CBSD is used to encompass all possible forms of CBSD: predominantly offline, predominantly online, or mixed forms.

METHODS

The present work was performed in accordance with the PRISMA 2020 statement, an updated guideline for reporting systematic reviews (Page et al., 2021) (see PRISMA checklists in supplementary material, S1 and S2). The review was preregistered on Prospero International Prospective Register of Systematic Reviews (PROSPERO CRD42021257379) and the protocol is available under https://www.crd.york.ac.uk/prospero/. The main methodological adjustments of the preregistered protocol are mentioned below.

Identification of studies

Study selection criteria. The review included original research (no reviews, no meta-analyses, no case reports) published in scholarly peer reviewed journals between 2000 and December 2022 in the English language. In contrast to the preregistered protocol, the timeframe for the literature search was extended until mid-December 2022. The treatment studies had to include patients with diagnosed CBSD. Participants in the case groups should have received some type of treatment to reduce symptoms of CBSD (e.g., individual psychotherapy, group psychotherapy, medication), while those in the control conditions should not have completed any specific treatment for CBSD or should have undergone only unspecific treatment. Included were case-control (between-group comparisons) and open (within pre-post comparisons) studies.

Studies were excluded if excessive buying/shopping occurred only as a specifier of hoarding disorder, symptom of other disorders (e.g., bipolar disorder, hypomania, mania), result of dopaminergic medication for other disorders (e.g., Parkinson's disease, restless legs syndrome), or symptom of panic buying (not CBSD) during the Covid-19 pandemic. Further reasons for exclusion were: no original or empirical research, case study, lack of quantitative data on treatment evaluation (i.e., symptoms of CBSD as primary endpoint not assessed), and no English language reports.

Information sources and search strategies. The following databases were searched (last search December 15th, 2022): PubMed, Scopus, Web of Science and PsycInfo. Complex search strings for titles/abstracts were used to cover the broad range of possible terms for CBSD. As an example, Table 1 shows the search string for PubMed (see supplementary material S3 for full search strategy of all databases).

In addition to the preregistered protocol of this study, the following trial registers were searched (last search June 08th, 2023) for ongoing preregistered treatment studies for CBSD: Open Science Framework (OSF), International Standard Randomised Controlled Trial Number (ISRCTN), ClinicalTrials.gov, EU Clinical Trials Registry, BMC Trials, CenterWatch, American Economic Association RCT Registry, German Clinical Trials Register (DRKS). The search terms used were "buying" OR "shopping" AND "treatment" OR "therapy" OR "psychotherapy" OR "medication".

Study selection procedure. Studies were selected by using a two-stage procedure. In a first step, two of the authors (NML, TAT) independently screened titles and abstracts. Potential doubts or inconsistencies between both authors about the eligibility of identified studies were discussed and resolved with supervision by the first author (AM) who also performed an additional screening of existing systematic reviews on CBSD treatment (Bullock & Koran, 2003; Goslar et al., 2020; Hague et al., 2016; Leite, Pereira, et al., 2014; Soares et al., 2016; Vasiliu, 2022) to ensure that no studies were overlooked. In a second step, the first (AM) and the last (EG) author independently examined the full texts of selected articles. In case of disagreements consensus was made regarding the in- or exclusion of studies with the assistance of the whole study team (i.e. all authors).

Data extraction and analysis

Narrative and quantitative analyses of primary outcomes were performed by the first (AM) and last (EG) author. Results are provided for controlled psychotherapy and pharmacological studies. Effect sizes Cohen's d and 95% confidence intervals (CIs) for primary CBSD outcomes for the contrasts baseline vs. post treatment and baseline vs. follow-up are provided (or calculated if not reported in the original publication) in tabular form to enable comparisons. As recommended by Dunlap, Cortina, Vaslow, and Burke (1996) the effect sizes were calculated for independent variables instead of dependent variables as effect sizes for dependent variables often overestimate the actual size of effect. Based on benchmarks suggested by Cohen (1988), $d = 0.2$ was considered a small, $d = 0.5$ a medium and $d = 0.8$ a large effect.

Risk of bias assessment

The risk of bias (RoB) assessment followed the approach of previous systematic reviews on treatment for behavioral addictions (Antons et al., 2022; King et al., 2017). Quality of reporting was evaluated with the CONSORT guideline for randomized controlled trials. It consists of 37 criteria

Table 1. Full search strings for Pubmed

	Search string title/abstract
CBSD	((„buying addict*“[Title/Abstract]) OR („addictive buyi*“[Title/Abstract]) OR („compulsive buyi*“[Title/Abstract]) OR („impulsive buyi*“[Title/Abstract]) OR („problematic buyi*“[Title/Abstract]) OR („pathological buyi*“[Title/Abstract]) OR („excessive buyi*“[Title/Abstract]) OR („compensatory buyi*“[Title/Abstract]) OR („obsessive buyi*“[Title/Abstract]) OR („buying disord*“[Title/Abstract]) OR („shopping addict*“[Title/Abstract]) OR („addictive shop*“[Title/Abstract]) OR („compulsive shop*“[Title/Abstract]) OR („impulsive shop*“[Title/Abstract]) OR („problematic shop*“[Title/Abstract]) OR („pathological shop*“[Title/Abstract]) OR („excessive shop*“[Title/Abstract]) OR („compensatory shop*“[Title/Abstract]) OR („obsessive shop*“[Title/Abstract]) OR („shopping disord*“[Title/Abstract]) OR („spending addict*“[Title/Abstract]) OR („addictive spend*“[Title/Abstract]) OR („compulsive spend*“[Title/Abstract]) OR („impulsive spend*“[Title/Abstract]) OR („problematic spend*“[Title/Abstract]) OR („pathological spend*“[Title/Abstract]) OR („excessive spend*“[Title/Abstract]) OR („compensatory spend*“[Title/Abstract]) OR („obsessive spend*“[Title/Abstract]) OR („spending disord*“[Title/Abstract]) OR („purchasing addict*“[Title/Abstract]) OR („addictive purchas*“[Title/Abstract]) OR („compulsive purchas*“[Title/Abstract]) OR („impulsive purchas*“[Title/Abstract]) OR („problematic purchas*“[Title/Abstract]) OR („pathological purchas*“[Title/Abstract]) OR („excessive purchas*“[Title/Abstract]) OR („compensatory purchas*“[Title/Abstract]) OR („obsessive purchas*“[Title/Abstract]) OR („purchasing disord*“[Title/Abstract]) OR („buying problem*“[Title/Abstract]) OR („shopping problem*“[Title/Abstract]) OR („spending problem*“[Title/Abstract]) OR („purchasing problem*“[Title/Abstract]) OR („shopahol*“[Title/Abstract]) OR („onioman*“[Title/Abstract]) OR („overshop*“[Title/Abstract]) OR („hyperspend*“[Title/Abstract]) OR („overspend*“[Title/Abstract]))
	AND
Treatment	(„treat*“[Title/Abstract]) OR („therap*“[Title/Abstract]) OR („psychotherap*“[Title/Abstract]) OR („medic*“[Title/Abstract]) OR („train*“[Title/Abstract]) OR („counsel*“[Title/Abstract]) OR („intervent*“[Title/Abstract]) OR („educ*“[Title/Abstract]) OR („psychoeduc*“[Title/Abstract]) OR („trial*“[Title/Abstract]) OR („psychopharm*“[Title/Abstract]) OR („pharm*“[Title/Abstract]) OR („self help*“[Title/Abstract]) OR („self-help*“[Title/Abstract]) OR („anonymous“[Title/Abstract]) OR („CBT“[Title/Abstract]) OR („case stud*“[Title/Abstract]) OR („case serie*“[Title/Abstract]) OR
	(continued)
	(„case report*“[Title/Abstract]) OR („casuistic*“[Title/Abstract]))
Date	(“2000/01/01”[Date – Publication]: “2022/12/15”[Date – Publication]))

Note. CBSD = compulsive buying-shopping disorder

(assigned to 25 sections) rated as ‘0’ (not present at all), ‘1’ (partially present) or ‘2’ (present) (Moher et al., 2012). If no evaluation of the item was possible or if the item was not applicable (e.g., open studies or if no randomization was done in controlled trials), no rating was given. The sum score for each study could vary from 0 to 74, with higher scores indicating a higher quality of reporting (i.e. lower RoB). The CONSORT criteria for each study were independently assessed by the first (AM) and last (EG) author. Inconsistencies were discussed between the two authors and resolved if possible. In case of disagreement, the respective items were reassessed jointly by two other authors (SSL, MB) and consensus was found.

RESULTS

Extracted studies and diagnosis

Figure 1 presents the flow diagram showing the in- and exclusion process during the systematic literature search. Characteristics and main outcomes of the included 13 studies are detailed in Table 2 (open studies) and Table 3 (controlled studies). We identified six psychotherapy studies, two of those were open trials (Filomensky & Tavares, 2009; Granero et al., 2017) and four were randomized controlled studies (Benson, Eisenach, Abrams, & van Stolk-Cooke, 2014; Mitchell, Burgard, Faber, Crosby, & de Zwaan, 2006; Müller, Arikian, de Zwaan, & Mitchell, 2013; Müller, Mueller, et al., 2008). In terms of the seven included pharmacological studies, two were open studies (Grant, Odlaug, Mooney, O’Brien, & Kim, 2012; Koran, Bullock, Hartston, Elliott, & D’Andrea, 2002), another two started with an open-label phase that was followed by a double-blind discontinuation phase (Koran, Aboujaoude, Solvason, Gamel, & Smith, 2007; Koran, Chuong, Bullock, & Smith, 2003), and three studies had a clear placebo-controlled design (Black, Gabel, Hansen, & Schlosser, 2000; Nicoli de Mattos et al., 2020; Ninan et al., 2000).

All identified studies included treatment-seeking patients with the primary diagnosis being CBSD. Most studies (Benson et al., 2014; Black et al., 2000; Filomensky & Tavares, 2009; Grant et al., 2012; Koran et al., 2002; Müller et al., 2013; Müller, Mueller, et al., 2008) applied the criteria for compulsive buying proposed by McElroy et al. (1994) or a combination of those criteria and questionnaire and/or interview thresholds (Granero et al., 2017; Koran et al., 2003, 2007) to define patients with CBSD. Other studies reported that they used a questionnaire only (Mitchell et al., 2006) or a structured clinical interview (Ninan et al., 2000).

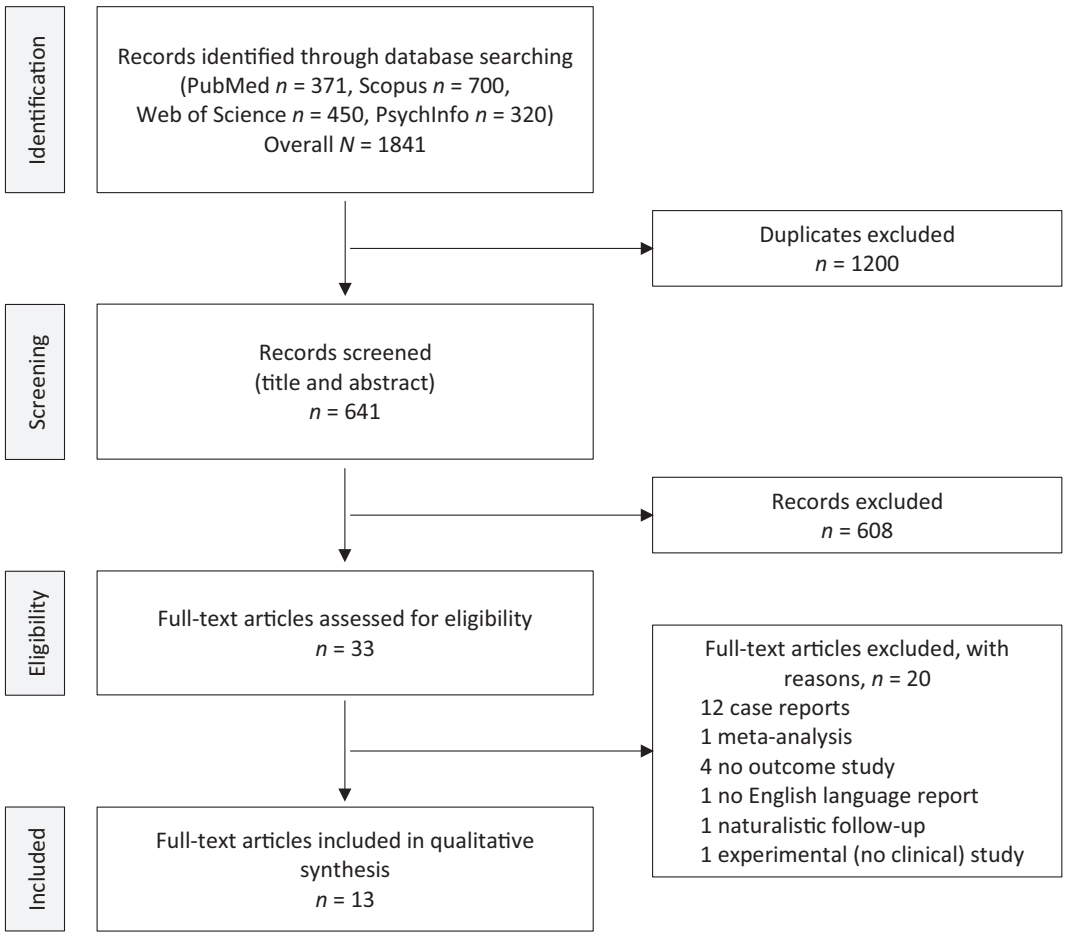

Fig. 1. Flow diagram

The additional search for preregistered ongoing treatment trials did not yield any hits.

Sample characteristics and interventions

None of the included studies specifically addressed online CBSD. The preferred mode of buying/shopping (N = 39; 89% in-store, 6% internet, 2% TV, 3% catalogue shopping) was reported in only one study (Mitchell et al., 2006). Most of the 13 identified studies were conducted in the United States (Benson et al., 2014; Black et al., 2000; Grant et al., 2012; Koran et al., 2002, 2003, 2007; Mitchell et al., 2006; Müller et al., 2013; Ninan et al., 2000). Two studies were performed in Brazil (Filomensky & Tavares, 2009; Nicoli de Mattos et al., 2020) and one study each in Germany (Müller, Mueller, et al., 2008) and Spain (Granero et al., 2017). Within all studies, mean ages of participants ranged between 24.0 and 46.55 years, and the vast majority of participants were women (range 72–100%). Three studies included only women (Black et al., 2000; Koran et al., 2007; Mitchell et al., 2006). In terms of treatment, 193 (87 in controlled studies and 106 in open studies) persons received psychotherapy, 156 (84 in open studies, 72 in controlled studies) received pharmacological treatment, and 149 participants were assigned to a waitlist or placebo-control group. Detailed information on sample characteristics and interventions is provided in Table 2 (open studies) and Table 3 (controlled studies).

With respect to psychotherapy, all but one of the studies used group treatment. In the open psychotherapy study by Granero et al. (2017), 12 sessions of individual CBT were applied (Granero et al., 2017; Jiménez-Murcia, Aymamí-Sanromà, Gómez-Peña, Álvarez-Moya, & Vallejo, 2006). Another open study used 20 sessions group CBT with particular focus on identifying and changing cognitive patterns that influence buying/shopping behavior (Filomensky & Tavares, 2009). Four psychotherapy studies compared group psychotherapy with waitlist (Benson et al., 2014; Mitchell et al., 2006; Müller et al., 2013; Müller, Mueller, et al., 2008) and one of them also compared telephone-guided self-help (GSH) with the waitlist condition (Müller et al., 2013). Three of the four controlled studies were based on the same 12-session CBT manual (Müller & Mitchell, 2011; Müller, Mitchell, & de Zwaan, 2008). The fourth controlled 12-session group psychotherapy study applied a combination of CBT, dialectical behavior therapy (DBT), psychodynamic psychotherapy (PD), acceptance and commitment therapy (ACT) and mindfulness-based interventions (Benson et al., 2014). In the pharmacological studies different medications were tested: selective serotonin

Table 2. Characteristics and main findings of included open studies for compulsive buying-shopping disorder (CBSD)

Study Country	Diagnosis of CBSD	Treatment	Treatment group (TG)	Primary endpoints	Main outcomes (pre to post treatment)
Psychotherapy					
Granero et al. (2017) Spain	SCID-I, McElroy et al. criteria	12 sessions individual CBT	$N = 97$ $M_{age} = 43.9 \pm 11.2$ 72.2% female	Compliance, relapses and dropout during the intervention	Moderate (49.5%), bad (27.8%) and good (22.7%) compliance Relapses 47.4% Risk of dropout 46.4%
Filomensky and Tavares (2009) Brazil	McElroy et al. criteria	20 sessions group CBT (focusing on cognitive restructuring)	$N = 9$ $M_{age} = 41.8$ 88.9% female	Y-BOCS-SV	Significant improvement
Psychopharmacology					
Grant et al. (2012) USA	McElroy et al. criteria	Memantine 10 weeks up to 30 mg d^{-1}	$N = 10$ $M_{age} = 32 \pm 12.4$ 88.9% female Dropout: 10%	Y-BOCS-SV	Significant improvement
Koran et al. (2007) USA	Y-BOCS-SV, McElroy et al. criteria	Escitalopram 7 weeks up to 20 mg d^{-1} (followed by 9-week double-blind discontinuation phase)	$N = 26$ $M_{age} = 45.1 \pm 11.6$ 100% female	Y-BOCS-SV	Significant improvement
Koran et al. (2003) USA	Y-BOCS-SV, McElroy et al. criteria	Citalopram 7 weeks up to 60 mg d^{-1} (followed by 7-week double-blind discontinuation phase)	$N = 24$ $M_{age} = 45.0 \pm 12.0$ 96% female Dropout: 4.2%	Y-BOCS-SV CBS	Significant improvement
Koran (2002) USA	McElroy et al. criteria	Citalopram 12 weeks up to 60 mg d^{-1}	$N = 24$ $M_{age} = 43.7 \pm 8.1$ 91.7% female Dropout: 16.7% for treatment Dropout: another 20% for 6-months-FU	Y-BOCS-SV, end of treatment and 6-months-FU interviews	Significant improvement and 71% responders at end of treatment. 6-months-FU: Those who continued citalopram, were less likely to relapse.

Note: CBT = Cognitive-behavioral therapy; CBS = Compulsive Buying Scale; FU = Follow-up; SCID-I = Structured Clinical Interview for DSM IV Axis I covering impulsive control disorders; Y-BOCS-SV = Yale–Brown Obsessive Compulsive Scale-Shopping Version.

re-uptake inhibitors (SSRIs) (Black et al., 2000; Koran et al., 2002, 2003, 2007; Ninan et al., 2000), the N-methyl-D-aspartate receptor antagonist memantine (Grant et al., 2012) and the anticonvulsant topiramate (Nicoli de Mattos et al., 2020). The rationale for the use of SSRIs was based on analogies between CBSD and obsessive-compulsive disorders (i.e., repetitive problematic behavior, preoccupation). It was assumed that enhancement of serotonergic neurotransmission would decrease the extreme preoccupations with buying/shopping and the repetitive consumption activities (Black et al., 2000; Koran et al., 2002, 2003). With regard to memantine it was presumed that the medication would improve patients' cognitive flexibility and response inhibition by modulating glutamatergic neurotransmission in the cortex, resulting in an improvement of CBSD (Grant et al., 2012). The anticonvulsant topiramate was used to facilitate neurotransmission of γ-aminobutyric acid (GABA) and to inhibit glutamatergic activity, leading to reduced neural excitability and modulation of dopamine activity in the brain reward circuity (Nicoli de Mattos et al., 2020). Topiramate has a complex effect on both the GABAergic and glutamatergic system and may regulate the functioning of the nucleus accumbens in addictive processes (Nourredine et al., 2021).

In the open medication studies the SSRI citalopram (Koran et al., 2002) or the N-methyl-D-aspartate receptor antagonist memantine (Grant et al., 2012) was administered over 10 or 12 weeks respectively. Two controlled medication studies investigated the SSRI fluvoxamine (Black et al., 2000; Ninan et al., 2000). Another two studies started with an open-label phase with the SSRIs citalopram (Koran et al., 2003) or escitalopram (Koran et al., 2007) over seven weeks followed by a nine-week double-blind discontinuation phase. The most recent study tested the anticonvulsant

Table 3. Characteristics and main findings of included controlled studies for compulsive buying-shopping disorder (CBSD)

Study Country	Diagnosis of CBSD	Treatment	Treatment group (TG)	Control group (CG)	Primary endpoints	Main outcomes
Psychotherapy						
Mitchell et al. (2006) USA	CBS	12 sessions group CBT	CBT $n = 28$ $M_{age} = 45.1 \pm 10.2$ 100% female Dropout 25%	WL $n = 11$ $M_{age} = 44.6 \pm 11.2$ 100% female Dropout 36.4%	CBS, Y-BOCS-SV, purchasing recall changes pre to post treatment and 6-months-FU (only TG)	Significant differences between CBT and WL on primary outcomes; improvement CBT > WL CBT: improvement maintained at FU
Müller, Mueller, et al. (2008) Germany	McElroy et al. criteria	12 sessions group CBT	CBT $n = 31$ 87.1% female $M_{age} = 45.3 \pm 8.5$ Dropout 19.4%	WL $n = 29$ 82.8% female $M_{age} = 37.2 \pm 10.5$ Dropout 13.8%	CBS, Y-BOCS-SV, G-CBS changes pre to post treatment and 6-months-FU (only TG)	Significant differences between CBT and WL on primary outcomes; improvement CBT > WL CBT: improvement maintained at FU
Müller et al. (2013) USA	McElroy et al. criteria	12 sessions group CBT Guided self-help (5 telephone sessions at week 1,2,3,5,8)	CBT $n = 22$ Dropout 27.3% (age and sex not reported for TG)	WL $n = 14$ Dropout: 28.6% (age and sex not reported for CG) GSH $n = 20$ Dropout: 15.0% (age and sex not reported for CG)	CBS, Y-BOCS-SV changes pre to post treatment and 6-months-FU (only TG)	Y-BOCS-SV: significant time × group interactions, significant improvement in CBT and GSH but not in waiting list CBS: no significant time x group interaction, but significant improvement in CBT and GSH CBT and GSH: improvement maintained at FU
Benson et al. (2014) USA	McElroy et al. criteria	12 group sessions 'Stopping Overshopping' treatment (including CBT, DBT, psychodynamic, ACT, and mindfulness-based interventions)	'Stopping overshopping' $n = 6$ (age and sex not reported for TG) Dropout 0%	WL $n = 5$ (age and sex not reported for CG) Dropout 0%	Change score means Valence-CBS, Richmond-CBS, CBS, Y-BOCS-SV; Purchasing recalls pre, mid, post, 6-months-FU (only TG)	Significant improvement in all measures, TG > WL
Psychopharmacology						
Black et al. (2000) USA	McElroy et al. criteria, duration of CBSD of at least 1 year	Fluvoxamine up to 300 mg d^{-1} 9 weeks	Fluvoxamine $n = 12$ 100% female $M_{age} = 42.0 \pm 11.0$ Dropout 25%	Placebo $n = 11$ 91.0% female; $M_{age} = 42.3 \pm 9.8$ Dropout 18%	Y-BOCS-SV changes pre to post treatment	Both groups improved similarly

(continued)

Table 3. Continued

Study Country	Diagnosis of CBSD	Treatment	Treatment group (TG)	Control group (CG)	Primary endpoints	Main outcomes
Ninan et al. (2000) USA	ICD-SCID criteria for CBSD	Fluvoxamine up to 300 mg d^{-1} 12 weeks	Fluvoxamine $n = 20$, age and sex not reported by group	Placebo: $n = 17$, age and sex not reported by group	Y-BOCS-SV changes pre to post treatment	No significant time × group effect
Koran et al. (2003) USA	Y-BOCS-SV, McElroy et al. criteria	Citalopram up to 60 mg d^{-1} 9-week double-blind discontinuation phase (after 7-week open-label phase)	Citalopram $n = 7$ (age and sex not reported for TG)	Placebo $n = 8$ (age and sex not reported for CG)	Relapse rate (i.e. Y-BOCS-SV score ≥17) end of week 7 to end of week 16; CBS, Impulse Buying Tendency Scale	Relapse rates: 0% (TG) vs. 62.5% (CG); Improvement in CBS and Impulse Buying Tendency Scale (reached at end of open-label phase) maintained in TG but not CG
Koran et al. (2007) USA	Y-BOCS-SV, McElroy et al. criteria	Escitalopram up to 20 mg d^{-1} 9-week double-blind discontinuation phase (after 7-week open-l phase)	Escitalopram $n = 8$ 100% female (age not reported for TG)	Placebo $n = 9$ 100% female (age not reported for CG)	Relapse rate (i.e. Y-BOCS-SV score ≥17) end of week 7 to end of week 9	Relapse rates: 62.5% (TG) vs. 66.7% (CG)
Nicoli de Mattos et al. (2020) Brazil	McElroy et al. criteria, SCID	Topiramate up to 300 mg d^{-1} 12 weeks and 4 sessions of psychoeducation (at week 1, 4, 7, 10)	Topiramate $n = 25$ $M_{age} = 37.2 \pm 9.1$ 80.9% female Dropout 28%	Placebo $n = 25$ $M_{age} = 39.5 \pm 10.1$ 82.6% female Dropout 12%	Y-BOCS-SV, CBS, CBFS changes pre to post treatment	No significant time × group effect (in Y-BOCS-SV and CBS) Improvement time × group (CBSF)

Note. ACT = Acceptance and Commitment Therapy; CBFS = Compulsive Buying Follow-up Scale; CBS = Compulsive Buying Scale; CBT = Cognitive Behavioral Treatment; DBT = Dialectical Behavior Therapy; FU = Follow-Up Assessment; G-CBS = German Compulsive Buying Scale; GSH = Guided Self-help; ICD-SCID = Structured Clinical Interview for impulse control disorders; Richmond-CBS = Richmond Compulsive Buying Scale; SCID = semi-structured interview modeled after the Schedules for clinical assessment in neuropsychiatry; Valence-CBS = Valence Compulsive Buying Scale; WL = Waiting List; Y-BOCS-SV = Yale–Brown Obsessive Compulsive Scale-Shopping Version.

topiramate over nine to 12 weeks against placebo pills (Nicoli de Mattos et al., 2020).

Primary outcome measures

Table 4 provides an overview of measures that were applied to assess changes in CBSD symptomatology or other treatment outcomes. Most studies made use of the shopping adaptation (Monahan, Black, & Gabel, 1996) of the Yale-Brown Obsessive-Compulsive Scale (YBOCS) (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989) and/or the Compulsive Buying Scale (CBS) (Faber & O'Guinn, 1992) as primary outcome(s). While the YBOCS-shopping version (YBOCS-SV) is a widely used instrument to measure severity and change in shopping obsessions and compulsions (Monahan et al., 1996), the CBS was developed as a screening tool for CBSD (Faber & O'Guinn, 1992).

Other questionnaires that were utilized to assess changes in CBSD symptomatology were the Compulsive Buying Measurement Scale developed by Valence, d'Astous, and Fortier (1988), the Richmond Compulsive Buying Scale (Ridgway, Kukar-Kinney, & Monroe, 2008), German Compulsive Buying Scale (Raab, Neuner, Reisch, & Scherhorn, 2005), Compulsive Buying Follow-up Scale (Nicoli de Mattos, Zambrano Filomensky, & Tavares, 2019), and Impulse Buying Tendency Scale (Weun, Jones, & Beatty, 1998). Furthermore, purchasing recalls (Benson et al., 2014; Mitchell et al., 2006) and compliance to the treatment guidelines, relapse and drop-out rates (Granero et al., 2017) were used as primary outcome measures.

Risk of bias assessment

Detailed information on risk of bias assessment is given in Table 5. The quality of reporting scores ranged between 11 and 47. Three studies (Müller et al., 2013; Müller, Mueller,

Table 4. Measures that were applied to assess changes in CBSD symptomatology and other treatment outcomes across included studies

Questionnaires	Abbreviation	Reference	Studies
Yale-Brown Obsessive Compulsive Scale-Shopping Version	Y-BOCS-SV	Monahan et al. (1996)	Benson et al. (2014) Black et al. (2000) Filomensky and Tavares (2009) Grant et al. (2012) Koran et al. (2002) Koran et al. (2003) Koran et al. (2007) Mitchell et al. (2006) Müller, Mueller, et al. (2008) Müller et al. (2013) Nicoli de Mattos et al. (2020) Ninan et al. (2000)
Compulsive Buying Scale	CBS	Faber & O'Guinn (1992)	Benson et al. (2014) Koran et al. (2003) Mitchell et al. (2006) Müller, Mueller, et al. (2008) Müller et al. (2013) Nicoli de Mattos et al. (2020)
Valence Compulsive Buying Scale	CBS-Valence	Valence et al. (1998)	Benson et al. (2014)
Richmond Compulsive Buying Scale	CBS-Richmond	Rief and Hofmann (2018)	Benson et al. (2014)
German Compulsive Buying Scale	G-CBS	Valence et al. (1988) Raab et al. (2005)	Müller, Mueller, et al. (2008)
Impulse Buying Tendency Scale	n/a	Weun et al. (1998)	Koran et al. (2003)
Compulsive Buying Follow-up Scale	CBFS	Nicoli de Mattos et al. (2019)	Nicoli de Mattos et al. (2020)
Other outcome measures	*Definition*		
Purchasing recalls	Number of CBSD episodes, total amount of money spent, total amount of time spent shopping over a certain time period		Benson et al. (2014) Mitchell et al. (2006)
Relapse	Occurrence of an episode once treatment had begun		Granero et al. (2017)
	Y-BOCS-SV score ≥17		Koran et al. (2003) Koran et al. (2007)
Compliance	Patients' adherence in performing inter-sessions tasks (e.g., recording their spending, avoiding risky situations and controlling their spending by presenting receipts)		Granero et al. (2017)
Dropout	Missing therapy sessions on three or more occasions without notifying the therapist		Granero et al. (2017)

et al., 2008; Nicoli de Mattos et al., 2020) reached a RoB assessment score higher than 50% of possible points. Only three studies were registered (Grant et al., 2012; Müller, Mueller, et al., 2008; Nicoli de Mattos et al., 2020).

The sample size of most studies was small. This is also true for the three studies with the highest RoB scores, which had 31 (Müller, Mueller, et al., 2008) or 22 patients (Müller et al., 2013) in their CBT groups or 25 patients in the verum group (Nicoli de Mattos et al., 2020). An a priori sample size determination was reported in the placebo-controlled medication study by Nicoli de Mattos et al. (2020) but in none of the other studies. The open psychotherapy study by Granero et al. (2017) examined the largest sample with 97 patients. In some studies, there were even fewer than 10 patients in the psychotherapy (Benson et al., 2014; Filomensky & Tavares, 2009) or verum (Grant et al., 2012; Koran et al., 2003, 2007) groups.

Main treatment outcomes

Psychotherapy. Almost all psychotherapy studies reported significant changes in symptoms of CBSD measured with the CBS and/or YBOCS-SV from baseline to end of treatment (Benson et al., 2014; Filomensky & Tavares, 2009; Mitchell et al., 2006; Müller et al., 2013; Müller, Mueller, et al., 2008). Granero et al. (2017) used different outcomes and reported about good compliance with therapy guidelines

Table 5. Risk of bias (RoB) assessment with CONSORT items

		Controlled psychotherapy studies				Controlled pharmacological studies					Open psychotherapy studies		Open pharmacological studies	
CONSORT item		Müller, Mueller, et al. (2008)	Müller et al. (2013)	Benson et al. (2014)	Mitchell et al. (2006)	Nicoli de Mattos et al. (2020)	Black et al. (2000)	Koran et al. (2003)	Ninan et al. (2000)	Koran et al. (2007)	Granero et al. (2017)	Filomensky & Tavares (2009)	Grant et al. (2012)	Koran (2002)
Title and	1a	2	0	2	0	2	0	0	0	0				
abstract	1b	2	1	1	1	1	1	1	1	0	1		1	1
Background and	2a	2	2	2	2	2	1	2	1	1	2	1	1	2
objectives	2b	1	2	2	0	2	1	2	1	1	1	1	2	2
Trial design	3a	2	2	1	1	2	1	2	1	1	1	1	1	1
	3b													
Participants	4a	2	2	2	2	2	2	2	2	1	1	1	2	2
	4b	2	0	2	0	2	0	0	1	1	2	0	0	0
Interventions	5	2	2	2	2	2	2	2	2	2	2	1	1	1
Outcomes	6a	2	2	2	1	2	2	2	1	1	2	2	2	2
	6b													
Sample size	7a	0	0	0	0	2	0	0	0	0	0	0	0	0
	7b													
Sequence	8a	0	1	0	0	2	0	0	0	0				
generation	8b	0	2	0	0	2	0	0	0	0				
Allocation concealment mechanism	9	0	0	0	0	2	0	0	0	0				
Implementation	10	0	0	0	0	0	1	0	0	0				
Blinding	11a	1	0	0	0	1	0	0	0	1				
	11b					0	0	0	0	0				
Statistical	12a	2	2	1	2	2	2	2	2	2				
methods	12b	2	2	1	0	1	0	0	0	0	2	2	1	1
Participant flow	13a	2	1	1	1	2	1	1	1	1			1	1
	13b	2	2	2	1	2	2	2	2	2	1	0	1	1
Recruitment	14a	2	1	1	1	2	0	1	0	1	0	0	2	1
	14b													
Baseline data	15	2	1	1	1	2	2	1	0	0	1	0	2	1
Numbers analyzed	16	2	2	2	2	2	2	2	2	2	2	0	1	1
Outcomes and	17a	2	2	1	2	2	1	1	1	1	1	0	1	1
estimation	17b	0	0	0	0	0	0	0	0	0	0	0	0	0
Ancillary analyses	18	2	2	2	0	1	0	0	0	0	1	0	1	0
Harms	19	0	0	0	0	2	2	1	2	1	0	0	2	1
Limitations	20	2	2	2	1	2	1	1	2	1	1	0	2	2

(continued)

Table 5. Continued

CONSORT item		Controlled psychotherapy studies				Controlled pharmacological studies					Open psychotherapy studies		Open pharmacological studies	
		Müller, Mueller, et al. (2008)	Müller et al. (2013)	Benson et al. (2014)	Mitchell et al. (2006)	Nicoli de Mattos et al. (2020)	Black et al. (2000)	Koran et al. (2003)	Ninan et al. (2000)	Koran et al. (2007)	Granero et al. (2017)	Filomensky & Tavares (2009)	Grant et al. (2012)	Koran (2002)
Generalizability	21	2	2	2	1	2	1	1	1	1	2	0	0	0
Interpretation	22	2	2	2	1	2	2	1	2	1	2	1	1	2
Registration	23	2	0	0	0	2	0	0	0	0	0	0	2	0
Protocol	24	2	0	0	0	2	0	0	0	0	0	0	0	0
Funding	25	1	1	0	1	2	1	1	1	1	1	1	1	1
RoB Sum		*47*	*38*	*34*	*23*	*56*	*28*	*28*	*26*	*23*	*26*	*11*	*28*	*24*

Note. References are sorted from lowest to highest risk of bias with higher sum scores indicating lower risk of bias. A detailed description of the CONSORT items can be retrieved from Moher et al. (2012). If no evaluation of the item was possible (e.g., open studies, no randomization), no rating was given.
1a = Identify as an "N-of-1 trial" in the title. For series: Identify as "a series of N-of-1 trials" in the title, 1b = Structured summary of trial design, 2a = Scientific background and explanation of rationale, 2b = Specific objectives or hypotheses, 3a = Describe trial design, planned number of periods, and duration of each period (including run-in and wash out, if applicable) and in addition for series: Whether and how the design was individualized to each participant, and explain the series design, 3b = Important changes to methods after trial start, 4a = Diagnosis or disorder, diagnostic criteria, comorbid conditions, and concurrent therapies. For series: Eligibility criteria for participants, 4b = Settings and locations where the data were collected, 4c = Whether the trial(s) represents a research study and if so, whether institutional ethics approval was obtained, 5 = The interventions for each period with sufficient details to allow replication, including how and when they were actually administered, 6a = Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed, 6b = Any changes to trial outcomes after the trial commenced, with reasons, 7a = How sample size was determined, 7b = When applicable, explanation of any interim analyses and stopping guidelines, 8a = Whether the order of treatment periods was randomized, with rationale, and method used to generate allocation sequence, 8b = When applicable, type of randomization; details of any restrictions, 9 = Mechanism used to implement the random allocation sequence, describing any steps taken to conceal the sequence until interventions were assigned, 10 = Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions, 11a = If done, who was blinded after assignment to interventions and how, 11b = If relevant, description of the similarity of interventions, 12a = Methods used to summarize data and compare interventions for primary and secondary outcomes, 12b = For series: If done, methods of quantitative synthesis of individual trial data, including subgroup analyses, adjusted analyses, and how heterogeneity between participants was assessed, 13a = For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analyzed for the primary outcome, 13b = For each group, losses and exclusions after randomization, together with reasons, 14a = Dates defining the periods of recruitment and follow-up, 14b = Whether any periods were stopped early and/or whether trial was stopped early, with reason(s), 15 = A table showing baseline demographic and clinical characteristics for each group, 16 = For each intervention, number of periods analyzed. In addition, for series: if quantitative synthesis was performed, number of trials for which data were synthesized, 17a = For each primary and secondary outcome, results for each group, and the estimated effect size and its precision, 17b = For binary outcomes, presentation of both absolute and relative effect sizes is recommended, 18 = Results of any other analyses performed, including assessment of carryover effects, period effects, intra-subject correlation. In addition for series: If done, results of subgroup or sensitivity analyses, 19 = All harms or unintended effects for each intervention, 20 = Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses, 21 = Generalizability of the trial findings, 22 = Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence, 23 = Registration number and name of trial registry, 24 = Where the full trial protocol can be accessed, if available, 25 = Sources of funding and other support, role of funders.

in only 23% of participants (50% moderate, 28% bad compliance), relapses during the CBT program in 47% and risk of dropout in 46% of the sample.

To ensure good comparability between studies, quantitative analyses refer to the CBS (Faber & O'Guinn, 1992) and YBOCS-SV (Monahan et al., 1996) as primary endpoints. Two studies did not report CBS or YBOCS-SV means by group (Benson et al., 2014; Filomensky & Tavares, 2009) and, as mentioned above, one study used other outcome variables (Granero et al., 2017). Therefore, quantitative synthesis was performed for the three remaining trials (Mitchell et al., 2006; Müller et al., 2013; Müller, Mueller, et al., 2008), presented in Table 6. The results indicate advantage of group CBT over waitlist across the studies and maintenance of treatment effects or even further improvement of CBSD at six-months-follow-ups (Mitchell et al., 2006; Müller et al., 2013; Müller, Mueller, et al., 2008). In the only three-arm study, group CBT and GSH were compared with a waitlist condition (Müller et al., 2013). At first glance, the within group effect sizes for the CBS and YBOCS-SV in Table 6 suggest comparable superiority of CBT and GSH to wait list. Between group effect sizes, defined as the difference between the end-of-treatment means of the CBT or GSH group and the waitlist group divided by the pooled standard deviation, were reported for CBT vs. waitlist (CBS $d = 1.00$; YBOCS-SV $d = 0.68$) and GSH vs. waitlist (CBS $d = 0.37$; YBOCS-SV $d = 0.36$) but not for CBT vs. GSH (Müller et al., 2013). The authors also provided information on clinically significant intra-individual changes in YBOCS-SV and CBS scores by using the reliable change index (RCI) (Jacobson & Truax, 1991). Participants in the CBT ($n = 22$) and GSH ($n = 20$) groups reported comparable clinical change from baseline to end of treatment in YBOCS-SV scores (CBT 50%, GSH 45%) that exceeded that in the waitlist condition ($n = 14$; 36% clinical change), whereas clinical relevant changes in CBS scores were found in 50% of the CBT, 10% of the GSH and 14% of the waitlist group (Müller et al., 2013).

Pharmacological treatment. Table 7 lists the results of the quantitative analysis of controlled pharmacological studies. Because the YBOCS-SV (Monahan et al., 1996) was a primary endpoint reported across all medication studies, the analysis refers to the YBOCS-SV results to ensure comparability. The findings of the three placebo-controlled studies (Black et al., 2000; Nicoli de Mattos et al., 2019; Ninan et al., 2000) did not suggest superiority of medication over placebo regardless of the drug used. Participants receiving the SSRI and those taking placebo pills improved similarly, indicating a high placebo response rate. In the study by Black et al. (2000), for example, over 60% of placebo-treated participants showed at least moderate improvement in CBSD symptomatology.

The findings of the two open-label studies followed by a double-blind discontinuation phase revealed mixed results. Koran et al. (2003) reported maintained improvement in the citalopram and deterioration of CBSD symptoms in the placebo group in the discontinuation phase. They evaluated the YBOCS-SV results not only continuously (means and *SD*s) but also categorically (i.e. Y-BOCS-SV scores ≥17 at end of treatment were defined as relapse) and found no relapses in the medication group compared to a relapse rate of 63.5% in the placebo group (Koran et al., 2003). The findings of the double-blind discontinuation phase reported by Koran et al. (2007) in a later study are not included in Table 7 because YBOCS-SV means and *SD*s were not provided by group. However, the relapse rates were reported and indicated no difference between the escitalopram and

Table 6. Quantitative synthesis of controlled psychotherapy studies sorted by risk of bias assessment

				Baseline vs. end of treatment		Baseline vs. 6-months FU	
				d [95% CI]		*d* [95% CI]	
	RoB	Primary endpoint	CBT	GSH	WLC	CBT	GSH
Müller, Mueller, et al. (2008)	47	CBS	0.68 [0.17, 1.19][a]		0.20 [−0.32, 0.72][a]	1.39 [0.78, 1.99][b]	
		YBOCS-SV	−0.86 [−1.38, −0.34][a]		−0.34 [−0.86, 0.17][a]	−1.05 [−1.63, −0.47][b]	
Müller et al. (2013)	38	CBS	1.44 [0.78, 2.11][a]	0.66 [0.02, 1.30][a]	0.37 [−0.38, 1.12][a]	2.47 [1.58, 3.37][b]	2.56 [1.61, 3.51][b]
		YBOCS-SV	−1.06 [−1.69, −0.43][a]	−1.17 [−1.84, −0.50][a]	−0.54 [−1.30, 0.21][a]	−1.60 [−2.38, −0.82][b]	−1.78 [−2.62, −0.93][b]
Mitchell et al. (2006)	23	CBS	1.06 [0.50, 1.62][a]		0.65 [−0.42, 1.72][b]	1.94 [1.91, 2.63][b]	
		YBOCS-SV	−2.20 [−2.87, −1.54][a]		−0.04 [−1.08, 1.01][b]	−3.69 [−4.66, −2.72][b]	

Note. RoB = risk of bias based on CONSORT criteria (higher scores indicate lower risk of bias), CBS = Compulsive Buying Scale, YBOCS-SV = Yale-Brown Obsessive-Compulsive Scale, FU = follow-up, CBT = cognitive behavioral therapy, GSH = guided self-help, WLC = waiting list control.

Cohen's *d* and 95% confidence intervals (CI) are reported. Positive d_{CBS} and negative $d_{YBOCS\text{-}SV}$ indicate improvement. [a]based on published intention-to-treat analysis, [b]based on published completer analysis. The findings of the controlled psychotherapy study by Benson et al. (2014) are not included in the quantitative synthesis because YBOCS-SV means and SDs were not provided by group.

Table 7. Quantitative synthesis of controlled pharmacological studies sorted by risk of bias assessment

	RoB	Primary endpoint	Baseline vs. end of treatment	
			d [95% CI]	
			Verum	Placebo
Nicoli de Mattos et al. (2020)	56	YBOCS-SV	−1.65 [−2.36, −0.95]	−1.17 [−1.80, −0.54]
Black et al. (2000)	28	YBOCS-SV	−1.12 [−1,98, −0.26]	−1.15 [−2.05, −0.24]
Koran et al. (2003)[a]	28	YBOCS-SV	−0.66 [−1.74, 0.41][b]	1.77 [0.62, 2.93][b]
Ninan et al. (2000)	26	YBOCS-SV	−1.39 [−2.08, −0.70]	−1.56 [−2.33, −0.79]

Note. RoB = risk of bias based on CONSORT criteria (higher scores indicate lower risk of bias), YBOCS-SV = Yale-Brown Obsessive-Compulsive Scale.
Cohen's *d* and 95% confidence intervals (CI) are reported. All based on published intention-to-treat analyses. Negative $d_{YBOCS-SV}$ indicate the effect size of improvement in compulsive buying-shopping disorder symptoms. [a]double-blind discontinuation phase of an open-label study.
The findings of the double-blind discontinuation phase reported by Koran et al. (2007) are not included in the quantitative synthesis because YBOCS-SV means and SDs were not provided by group.

the placebo group (62.5% vs. 66.7%, respectively) (Koran et al., 2007).

Predictors of outcome. Being male, high levels of depressive and obsessive-compulsive symptoms, low levels of anxiety symptoms and the personality traits high persistence, high harm avoidance and low self-transcendence (measured with the Temperament and Character Inventory-Revised (Cloninger, 1999) predicted poor therapy adherence in the open CBT study by Granero et al. (2017). In one of the controlled group CBT trials, more symptoms of hoarding disorder at baseline and a lower number of visited group sessions were associated with poorer treatment outcome (Müller, Mueller, et al., 2008).

DISCUSSION AND CONCLUSIONS

The aim of the present work was to perform a systematic update on treatment studies for CBSD published since 2000, with a particular focus on online CBSD. Our findings indicate that there is still a paucity of treatment studies for CBSD. Since the systematic reviews published through November 2022 (Goslar et al., 2020; Hague et al., 2016; Leite, Pereira, et al., 2014; Soares et al., 2016), no new controlled psychotherapy studies and only one new medication study (Nicoli de Mattos et al., 2020) were conducted. A search on established public trial registers revealed no evidence of currently ongoing preregistered treatment trials.

It is necessary to address overlaps and differences between the present systematic review and the recently published work by Vasiliu (2022). Both systematic reviews meet high quality standards, were performed in accordance with the PRISMA 2020 statement (Page et al., 2021), searched on established databases and assessed the quality of included reports using standardized checklists. Differences between the two systematic reviews refer to e.g., search strategies, qualitative and quantitative analyses of outcomes, and preregistration. Vasiliu (2022) included primary and secondary reports (i.e. clinical reports, clinical and epidemiological studies, reviews) on therapeutic management of CBSD published between 1990 and July 2022 and provided treatment recommendations by using GRADE criteria (Lewin et al., 2018). In contrast to Vasiliu's work, the present systematic review was preregistered, has a clear focus on original research (i.e. case reports, reviews and meta-analyses were excluded) published between 2000 and December 2022, uses more comprehensive search terms, provides quantitative analyses of primary outcomes (effect sizes) and evaluates the quality of reporting of included studies based on CONSORT guideline (Moher et al., 2012). Therefore, the current work is not only an update of the systematic reviews published before 2022, but adds to the literature on treatment for CBSD beyond the work of Vasiliu (2022). In the following, we will discuss the advantages and disadvantages of included studies in detail and provide recommendations for further treatment research.

None of the studies addressed online CBSD specifically. The preferred shopping environment was reported only in the very first CBT study, which was performed more than 17 years ago (Mitchell et al., 2006). The information was not considered in further analyses, likely because the vast majority of patients had indicated offline shopping (89%) (Mitchell et al., 2006). The lack of new treatment studies for CBSD and the gap in treatment studies specifically targeting problematic usage of online shopping applications is concerning given the high prevalence of CBSD (Maraz, Griffiths, & Demetrovics, 2016) and the increase in risky online buying/shopping (Adamczyk, 2021; Augsburger et al., 2020; Baggio et al., 2022; Fineberg, Menchon, et al., 2022; Maraz, Katzinger, & Yi, 2021; Müller, Steins-Loeber, et al., 2019). Below, we first discuss the results of psychotherapy studies and then turn to pharmacological treatment studies for CBSD.

Increasing certainty of pre-existing reviews and conclusions (Goslar et al., 2020; Hague et al., 2016; Leite, Pereira, et al., 2014; Vasiliu, 2022), the present update indicates that CBT, especially group CBT, is useful in the treatment of CBSD. CBT treatments were related to large pre-post and

pre-follow-up effect sizes (Table 6). Unfortunately, no conclusions can be drawn about other forms of psychotherapy (e.g., insight-oriented psychotherapy), third wave CBT (e.g., mindfulness-based, schema or acceptance and commitment therapy or behavioral activation) or internet-delivered approaches for CBSD due to the lack of studies. Although the findings consistently emphasize the advantage of CBT, poor methodological quality and the high risk of publication bias reduce the reliability of this conclusion. In terms of reporting bias, only two psychotherapy studies (Müller et al., 2013; Müller, Mueller, et al., 2008) reached a RoB assessment score higher than 50% of possible points. Substantial deficits across all psychotherapy studies were found in the report of the sample size determination, randomization procedure, unintended side effects and trial limitations. In all controlled CBT trials, sample sizes were small and ranged from six (Benson et al., 2014) to 31 (Müller, Mueller, et al., 2008) patients in the CBT group. The study by Granero et al. (2017) included a high number of patients ($N = 97$), but it did not have a control condition. Only one psychotherapy study was registered (Müller, Mueller, et al., 2008).

Predictors of treatment outcome were examined in two studies (Granero et al., 2017; Müller, Mueller, et al., 2008) which reported a negative impact of comorbid mental health problems, e.g., depressive or hoarding symptoms, and specific personality profiles, e.g., high compulsivity, on treatment outcome (Granero et al., 2017; Müller, Mueller, et al., 2008). Therapists' treatment adherence and therapeutic elements that may have contributed to the treatment outcome were not explored. Therefore, no insight can be derived regarding which specific psychotherapy techniques made the treatment effective for CBSD. The potential role of unspecified therapeutic factors such as patient engagement, affective experiencing, therapeutic alliance, readiness to change or resource activation (Tschacher, Junghan, & Pfammatter, 2014) must be considered as effective in light of the very high placebo rates in drug trials (which will be discussed below; e.g. (Black et al., 2000; Ninan et al., 2000)). Moreover, all controlled psychotherapy studies used a group format. It cannot be ruled out that common nonspecific factors of structured group psychotherapy such as e.g., emotional cohesion, sense of belonging, sense of universality, shared action orientation or coping modeling (Kealy & Kongerslev, 2022) were at least as associated with treatment outcome as the specific CBT interventions. It should also be noted that three out of the four controlled CBT studies used the same CBT manual and had a high degree of overlap of study teams (Mitchell et al., 2006; Müller et al., 2013; Müller, Mueller, et al., 2008) which reduces the generalisability of findings. An even more important critical point regards to the fact that – with a single exception (Müller et al., 2013) – the controlled psychotherapy trials relied exclusively upon waitlist controls. In psychotherapy research it is well known that the interpretation of effect sizes depend upon the choice of the control condition and that testing a treatment against waitlist is not a very strict approach (Steinert, Stadter, Stark, & Leichsenring, 2017). It is questionable whether waiting lists are the appropriate control condition for psychotherapy because common nonspecific therapeutic effects of CBT are not accounted for with waitlist design. Furthermore, potential nocebo effects in the waitlist group may falsely increase the effect size and result in overestimating the efficacy of CBT (Fineberg, Pellegrini, et al., 2022; Leichsenring & Steinert, 2017).

Only one psychotherapy study compared both group CBT and low-intensity telephone-guided self-help (GSH) with a waitlist condition (Müller et al., 2013). The within group effect sizes with broad confidence intervals listed in Table 6 might indicate a comparable benefit from group CBT and GSH and that both approaches were equally superior to waitlist. However, the between group effect sizes for CBT or GSH vs. waitlist reported in the original publication (Müller et al., 2013) rather lead to the assumption that this would be an erroneous non-inferiority guess. Unfortunately, the authors failed to report the between-group effect sizes for CBT vs. GSH. Furthermore, no non-inferiority margins that are necessary for comparing two active treatments (Rief & Hofmann, 2018) were defined for the comparison of CBT with GSH (Müller et al., 2013). Therefore, no valid interpretation on the comparability of group CBT and GSH is possible.

For all the criticism of the included CBT studies it should be taken into account that at least some of these studies (e.g., Mitchell et al., 2006) had a pilot character and can be viewed as pioneering work in the treatment of behavioral addictions. They were conducted at a time when very little attention was paid to CBSD. Nevertheless, larger sufficiently powered psychotherapy trials with appropriate control conditions and a focus on mechanisms of change, potential moderators (e.g., gender), mediators (e.g., craving responses, inhibitory control, depressive symptoms), and the preferred shopping mode (i.e., offline or online) should be conducted by different study teams. Of-course, this requires a better understanding of mechanisms underlying the development and maintenance of CBSD, which would help to develop more tailored psychotherapy interventions.

Unfortunately, no conclusion at all can be drawn regarding the psychotherapy of online CBSD. One could argue that the promising results of CBT studies could simply be transferred to online CBSD. In our assumption, this is questionable given the specific features of the internet and e-commerce (e.g., availability, anonymity, speed, technology and social-commerce features, specific payment options, convergence of internet application) that may contribute to problematic buying/shopping on the internet or even cause consumers to slip from risky to addictive online buying/shopping. There is already preliminary evidence for the role of individual expectancies and using motives in online CBSD (e.g., buying unobserved, avoiding analogue communication, browsing a huge product variety, satisfying an urge to buy promptly) (Kukar-Kinney et al., 2009; Trotzke et al., 2015). However, little is known about the impact of internet-related technology and social commerce features on compulsive online seeking for and purchasing of consumer products (Clark & Zack, 2023; Fineberg, Menchon, et al., 2022; Flayelle et al., 2023). Research on the interaction between

environmental factors and individual affective and cognitive mechanisms in online CBSD is still at the beginning (Brand, 2022; Brand et al., 2021; Fineberg, Menchon, et al., 2022; Vogel et al., 2018). More effort is needed to better understand the role of online access to consumer goods with respect to CBSD. This would stimulate proof-of-concept studies in order to develop new psychotherapy approaches for online CBSD or to augment existing CBT approaches for CBSD by modules that specifically target problematic online buying/shopping.

In terms of pharmacotherapy, our findings are in line with those of previous reviews that indicated a lack of evidence for drug treatment of CBSD (Goslar et al., 2020; Hague et al., 2016; Soares et al., 2016; Vasiliu, 2022). The open-label studies with SSRIs (Koran et al., 2003, 2007) or glutamatergic medication (memantine) (Grant et al., 2012) suggested an improvement in CBSD symptom severity between baseline and end of treatment but were limited by the lack of a control groups and follow-ups (Hague et al., 2016). Subsequent, controlled trials indicated similar effects of SSRIs and placebo pills (Black et al., 2000; Koran et al., 2007; Ninan et al., 2000). Only in the study by Koran et al. (2003) the relapse rate was higher in patients who continued taking the SSRI during the nine-week double-blind discontinuation phase after a seven-week open-label phase ($n = 7$) as compared to those in the placebo group ($n = 8$). Given the small number of patients participating in the discontinuation phase, the interpretation of the results is limited. Nevertheless, the results may encourage further research on the effectiveness of SSRIs in the treatment of CBSD.

The most recent controlled medication study tested the anticonvulsant topiramate against placebo (Nicoli de Mattos et al. ,2020). Topiramate had already shown promise in two earlier CBSD case studies (Guzman, Filomensky, & Tavares, 2007; Ye, Kadia, & Lippmann, 2014) and has been used off-label for the treatment of many types of mental disorders with impaired impulse control such as substance use and eating disorders (especially binge eating disorder) (for review see Chapron et al., 2022). The study by Nicoli de Mattos et al. (2020) had the lowest publication bias of all studies (psychotherapy and pharmacological) and the largest sample size within the drug trials included in the present review (i.e. $n = 25$ in each group). Similar to the controlled SSRI trials for CBSD (Black et al., 2000; Koran et al., 2007; Ninan et al., 2000), topiramate was not shown to be superior to placebo (Nicoli de Mattos et al., 2020). This is in accordance with recent systematic reviews which did not find clear evidence supporting the efficacy of topiramate in the treatment of individuals with high impulsivity (Chapron et al., 2022) or in the spectrum of addictive behaviors (Nourredine et al., 2021). In individuals with gambling disorder, for example, no treatment effect of topiramate on gambling symptom severity was found in a 14-week, double-blind, placebo-controlled trial ($n = 20$ topiramate, $n = 22$ placebo) (Berlin et al., 2013).

The high placebo rates in the pharmacological studies are striking. They were attributed to the positive effects of maintaining a daily diary to monitor CBSD symptoms (Ninan et al., 2000), reviewing buying/shopping episodes and money spent (Black et al., 2000), and other nonspecific factors with beneficial effects, as discussed above with regard to psychotherapy trials. This raises the question to what extent the high numbers of patients meeting responder status by the end of open-label treatments (Grant et al., 2012; Koran et al., 2002, 2003, 2007) were caused by a placebo effect.

Interestingly, no studies have been conducted with opioid antagonists (e.g., naltrexone, nalmefene) that inhibit dopamine release in the nucleus accumbens and were beneficial in reducing urges to engage in addictive behaviors such as pathological gambling (Aboujaoude & Salame, 2016; Dowling et al., 2022; Piquet-Pessoa & Fontenelle, 2016). Considering case reports, Grant (2003) had already reported about partial or complete remission of urges to shop in two women and one men with CBSD treated with naltrexone. It must be noted that the findings referred to high-dose naltrexone of 100–200 mg/d which exceeds the recommended naltrexone dosage of 50 mg/d (Aboujaoude & Salame, 2016) that has been shown to be effective in e.g., gambling disorder (Grant, Kim, & Hartman, 2008). High-dose use of naltrexone may pose a risk of liver damage and requires frequent liver function tests (Grant, 2003). This might be one reason why no controlled naltrexone studies have been performed for CBSD to date.

Taken together, the pharmacological studies included in this review are all preliminary with small samples and a heterogeneity in pharmacological treatment approaches. Insufficient understanding of the neurobiological mechanisms involved in CBSD and the lack of consistency surrounding its recognition as formal diagnosis are obstacles to conducting high quality pharmacological studies. In our opinion, it is also doubtful whether a purely drug-based treatment of CBSD, particularly online CBSD, can be successful in the long term given the assumed complex interactions between environmental, social and individual processes (Brand et al., 2019; Kellett & Bolton, 2009; Müller, Laskowski, Wegmann, et al., 2021; Trotzke, Brand, & Starcke, 2017).

It is important to take a critical look at the measures used to define CBSD and treatment outcomes. In almost all studies, the YBOCS-SV (Monahan et al., 1996) and/or CBS (Faber & O'Guinn, 1992) were used. The overlap of instruments across studies is a strength because it facilitates comparability of results, but the suitability of both instruments as diagnostic tools or outcome measures is limited. The YBOCS was modified 30 years ago for CBSD because of phenomenological similarities between obsessive-compulsive disorders and CBSD (i.e., repetitive problematic behavior, intrusive thoughts, resistance to such thoughts) (Monahan et al., 1996). Reliability and validity of the modified for shopping YBOCS version was initially tested in nine patients with CBSD (Monahan et al., 1996). In a Brazilian sample comprising 588 general population participants and 22 individuals with CBSD, the YBOCS-SV showed satisfactory psychometric properties (Leite, Filomensky, Black, & Silva, 2014). Unlike for example the pathological

gambling adaptation of the YBOCS (Pallanti, DeCaria, Grant, Urpe, & Hollander, 2005), the YBOCS-SV has not been validated in a larger sample with CBSD. Also, sensitivity to change of the YBOCS-SV has not been systematically investigated. In light of current common theoretical considerations that CBSD is more likely be understood as a disorder due to addictive behaviors (Brand et al., 2020; Müller, Brand, et al., 2019) or according to the ICD-11 as an impulse control disorder (WHO, 2022), the fit of an instrument developed for obsessive-compulsive disorders can be questioned. With regard to the use of the CBS it has to be noted that this questionnaire was developed as a screening tool for CBSD and not to diagnose CBSD or to measure change in symptom severity (Faber & O'Guinn, 1992). Some CBS items are outdated ("I wrote a check ….") or restricted to offline shopping ("When I enter a shopping center …") (Faber & O'Guinn, 1992). At the same time, it remains to be remembered that only few assessments for CBSD were available at the time when most drug trials were conducted. In the meantime, other questionnaires have been published that reliably and validly measure CBSD symptoms (Müller, Mitchell, Vogel, & de Zwaan, 2017), e.g., the Bergen Shopping Addiction Scale (BSAS) (Andreassen et al., 2015) and its adopted version for online shopping (Manchiraju, Sadachar, & Ridgway, 2017), and the Pathological Buying Screener (PBS) (Müller, Trotzke, Mitchell, de Zwaan, & Brand, 2015). The BSAS is based on the understanding that CBSD represents an addictive behavior (Andreassen et al., 2015). The PBS considers both addictive and impulse-control disorder facets of CBSD (Müller et al., 2015). Cut-off scores for risk of CBSD are available for both the BSAS (Andreassen et al., 2015; Zarate, Fullwood, Prokofieva, Griffiths, & Stavropoulos, 2022) and the PBS (Müller et al., 2015; Müller, Trotzke, et al., 2021), whereas only the PBS threshold for CBSD was validated in clinical samples (Fernandez-Aranda et al., 2019; Müller, Trotzke, et al., 2021). However, none of the currently available questionnaires for CBSD adequately represent the ICD-11 criteria for disorders due to addictive behaviors or impulse control disorders (WHO, 2022) and only the modified BSAS version for online shopping (Manchiraju et al., 2017) refers to online CBSD. There is a need for quantitative measures to assess symptom severity of CBSD. The requisite for valid assessment tools is the conceptualization of CBSD as formal diagnosis with accepted diagnostic criteria. As with other mental disorders, the clarification of diagnostic criteria of CBSD and the recognition of online CBSD as a form of problematic usage of the internet will encourage the establishment of standard diagnostic assessment tools and help researchers to compare the findings across treatment studies (Fineberg, Menchon, et al., 2022; Müller, Laskowski, Trotzke, et al., 2021).

Limitations

The present systematic review has some shortcomings. There is a potential risk of search biases given that studies published before 2000, non-English language manuscripts, grey literature and manuscripts that are not registered with PubMed, Scopus, Web of Science or PsycInfo were not considered. However, wide screening strings were used that were likely be over-inclusive. Additionally, manual search of related articles and reference lists was performed to reduce search biases. While case reports were excluded, open-label trials were included even if only a few patients were treated. The quality of reporting was assessed using the CONSORT criteria for randomized controlled trials, which is not entirely appropriate for the RoB rating of open-label studies. This limited approach was used given the small number of controlled studies. It is also important to note that the RoB assessment refers to the study reports. Hence, missing reports in the publications do not necessary mean that these methods were not used in the respective study.

Implications for future research

Research on CBSD treatment would profit from more systematic, high-quality methodology. Regarding psychotherapy, it is time to compare CBT with an active treatment based on a priori sample size determination using predefined non-inferiority margins. Much more attention should be paid to the mechanisms of change, treatment adherence, the role of specific and nonspecific therapeutic factors and negative side effects of treatment. Complementary computerized interventions to improve cognitive and affective processes relevant in addictive behaviors (e.g., cognitive bias modification training) should be investigated in relation to CBSD. Drug studies would benefit from further insight into the neurobiology of CBSD. Last but not least, future studies should systematically assess and consider the preferred shopping environment (offline, online), specifics of online compared to offline buying/shopping activities, comorbid mental disorders (e.g., hoarding disorder, depression, other potential internet-use disorders) and personality profiles (e.g., high impulsivity or compulsivity) when designing, conducting, and interpreting treatment studies.

Given the increasing importance of online shopping, research should address the question of whether the treatment of online CBSD differs from the treatment of traditional CBSD and, if so, in what aspects exactly. Specific online CBSD-related interventions could focus on dealing with constant availability of shopping websites, online shopping cues (e.g, personalized advertisements, social media influencer posts), technology design features, convergence of shopping platforms with other internet applications (e.g., social network sites) and relapse prevention (Flayelle et al., 2023; Müller, Joshi, & Thomas, 2022). Considering the findings indicating that younger consumers tend to engage in problematic online shopping more often than older individuals (Augsbuger et al., 2020; Duroy et al., 2014; Müller, Steins-Loeber, et al., 2019), more research on prevention or interventions targeting youth populations vulnerable to CBSD (e.g., because of high materialistic values endorsement), with a special emphasis on online CBSD, is necessary. Interventions to reduce a materialistic goal

orientation related to compulsive buying in young adults have already been examined (Lekavicienė et al., 2022; Parker, Kasser, Bardi, Gatersleben, & Druckman, 2020) and should be further elaborated.

CONCLUSIONS

To date, no treatment studies have been published specifically for online CBSD. The studies included in this systematic review did not differentiate between a predominant offline and a predominant online CBSD subtype. While group CBT was effective in reducing the symptom severity of CBSD, the results should be interpreted with caution given the absence of appropriate control conditions and the lack of investigation of nonspecific compared to specific treatment effects and mechanisms of change. Different pharmacological approaches have been investigated with serotonergic, glutamatergic and/or GABAergic medication, mainly not indicating superiority over placebo. Both, the psychotherapy and medication studies, were limited due to small samples, poor quality of reporting, and other methodological shortcomings. The present review extends past reviews by addressing online CBSD and considering potential publication bias in accordance with the CONSORT criteria. More high-quality treatment research is needed in the field of CBSD with more emphasis on the CBSD subtype and mechanisms of change.

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SUPPLEMENTARY MATERIAL

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