Are Self-Reported Difficulties in Emotional Regulation Associated with Hoarding? A Systematic Review

Jessica A. L. Barton[a], Dr Louise Johns[b], Professor Paul Salkovskis[c]

[a] Corresponding Author: jessica.barton5@nhs.net, +44 (0)1865 226431, Oxford Institute of Clinical Psychology Training and Research (OXICPTR), Isis Education Centre, Warneford Hospital, Headington, Oxford, 0X3 7JX. England, UK.

[b] OXICPTR, Isis Education Centre, Warneford Hospital, Headington, Oxford, 0X3 7JX. England, UK.

[c] OXICPTR, Isis Education Centre, Warneford Hospital, Headington, Oxford, 0X3 7JX. England, UK.

Declarations of interest: None

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Word Count: 8,952

Are Self-Reported Difficulties in Emotional Regulation Associated with Hoarding? A Systematic Review

Highlights

- Emotion regulation problems are associated with hoarding
- Specific dimensions of emotion regulation are associated with hoarding
- The temporal relationship between hoarding and emotion dysregulation is not clear

Jessica Barton
Oxford Institute of Clinical Psychology Training and Research

24.03.2021

Dear Professor Cougle,

We wish to submit an original research article entitled "Are Self-Reported Difficulties in Emotional Regulation Associated with Hoarding? A Systematic Review" for consideration by Journal of Obsessive Compulsive and Related Disorders.
We confirm that this work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere.

In this paper, a synthesis of the literature investigating the relationship between emotion regulation (ER) problems and hoarding is provided. First, the paper showed that ER problems are relevant but not diagnostically specific to hoarding compared to other forms of psychopathology. This is the first review to establish a link between these variables and thus expands our current understanding of factors maintaining problems with hoarding. Secondly, specific ER problems associated with hoarding are identified by this review. The specific ER problems identified by this review represent potentially modifiable treatment targets for this client group, as an adjunct to current CBT treatments. This is significant, as 65% of individuals with hoarding disorder do *not* experience clinically significant improvements in response to standard cognitive and behavioural treatments.

We believe that this manuscript is appropriate for publication by this journal because it i) extends the current understanding of the phenomenology of hoarding disorder, and ii) identifies relationships between cognitive and behavioural variables in hoarding.

We have no conflicts of interest to disclose.

Please address all correspondence concerning this manuscript to me at Jessica.barton5@nhs.net.
Thank you for your consideration of this manuscript.
Sincerely,

Jessica Barton

Abstract

Background: Emotion regulation (ER) problems, as operationalised by the Difficulties in ER Scale (DERS), have been identified as transdiagnostic features of psychopathology. **Aims:** The objectives were to synthesise the evidence to identify whether (a) ER difficulties are associated with hoarding and (b) if particular ER difficulties are associated with hoarding. **Method**: Peer-reviewed studies and published dissertations measuring the association between the DERS and hoarding were identified via PsycINFO, CINAHL, MEDLINE and EMBASE. Studies were assessed for quality using a modified Downs and Black checklist. **Results**: Eleven studies met inclusion criteria. Most were cross-sectional, with one employing an experimental design. Ten studies showed ER difficulties are significantly associated with hoarding. There is some evidence to suggest depression and anxiety could account for ER problems. Five studies analysed DERS subscales and hoarding. Most showed all DERS subscales, apart from Awareness, are associated with hoarding. **Conclusion**: Hoarding is associated with a (a) restricted capacity to understand emotions; (b) tendency to avoid emotions; (c) narrow repertoire of strategies to feel better; and (d) difficulties controlling behaviour when emotional. Reviewed studies suggest ER problems are relevant, but not unique, to hoarding. Longitudinal and experimental research is warranted to explore the direction of these relationships.

Key Words: Hoarding Disorder, Emotion Regulation, Emotion Dysregulation, Transdiagnostic Processes

Words: 199

1 Introduction

Hoarding disorder affects approximately 2.5% of the population in developed countries and represents a serious public health burden in terms of occupational impairment, physical health needs, and social service involvement (Postlethwaite et al., 2019). The Diagnostic and Statistical Manual of Mental Disorders (5th Ed; DSM-5) characterises hoarding disorder as the persistent acquisition and saving of possessions (American Psychiatric Association, 2013). Persistent problems acquiring and saving result in the build-up of clutter, such that living areas cannot be used as intended. The perceived need to save items, as well as great distress associated with parting with possessions, lead to hoarding behaviours. Hoarding behaviours also occur in the general population at a lower intensity and impact, suggesting a wide spectrum of severity from mild to severe (Steketee & Frost, 2003). Despite advances in the development of cognitive and behavioural treatments (CBT) for hoarding, 65% of treatment-seeking individuals with hoarding disorder do not experience clinically significant improvements following treatment (Tolin et al., 2015). Hence there is a need to expand the current understanding of factors maintaining hoarding to improve treatment outcomes and reduce the burden of distress associated with the condition.

Emotion regulation (ER) problems have been identified as maintenance factors for a variety of mental health conditions (Sloan et al., 2017). ER is a multifaceted construct comprising an individual's capacity to modulate the intensity, or duration, of emotions to successfully attain personal goals (Gratz & Roemer, 2004). Individuals with problems regulating the intensity or duration of emotions have been identified as more likely to develop and experience mental health problems (Aldao et al., 2016). According to Roemer and colleagues (2009), poor ER skills prompt the use of maladaptive cognitive and behavioural strategies to avoid distress. Whilst recent systematic reviews have

established that ER problems are linked to a range of psychopathologies, the literature assessing ER in hoarding has not yet been reviewed (Sloan et al., 2017; Aldao et al., 2010). This paper contributes to the current understanding of hoarding by systematically reviewing the relevant literature and establishing a link between ER problems and hoarding.

1.1 Defining Emotion Regulation

In order to review whether a relationship exists between ER problems and hoarding, a clear definition of ER must first be established. There is, however, failure in the broader literature to agree on which concepts constitute, or overlap with, ER problems (Berking & Wupperman, 2012; Nigg, 2017). Berking and Wupperman suggest that multi-disciplinary interest in ER gives rise to wide range of conceptualisations of ER, ranging from neurobiological, physiological, and cognitive explorations of the construct. ER strategies can be applied under deliberate control or automatically without conscious awareness, and are thus measured in different ways in the literature (Gross, 1998). ER processes under deliberate control refer to cognitive or behavioural strategies designed to immediately regulate emotions. ER strategies under deliberate control are typically measured via self-report measures, like the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) or the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). ER strategies can also be deployed automatically, such as averting eye-gaze away from distressing material or regulating the activity of neural substrates like the ventromedial pre-frontal cortex (Etkin, Buchel & Gross, 2015). Automatic ER processes are typically assessed using observational methodologies, such as persisting with frustrating tasks, or by measuring physiological arousal and brain activation (Wass, 2020).

As ER can be measured using a range of different methodologies, a scoping search was conducted to identify which aspects of ER have specifically been measured in relation to hoarding problems. The search identified seventeen different ways of measuring and conceptualising ER processes in hoarding, including physiological, self-report and observational measures of ER. Lack of consensus on which factors constitute ER makes synthesis of these findings difficult. To overcome issues of measurement regarding ER, this paper seeks to systematically review ER difficulties based on a single conceptualisation of ER most widely used within the hoarding research.

Gratz and Roemer's (2004) Multidimensional Conceptualisation of Emotional Regulation (MCER) was identified as most frequently applied in the field of hoarding. Gratz and Roemer's model of ER emphasises the importance of individual differences in the perceived capacity to tolerate emotions and function when emotional. According to this model, ER relates to four factors. That is, the extent to which individuals are (a) aware of emotional experiences; (b) accept emotions; (c) have access to a range of effective ER strategies; and (d) are able to effectively manage impulses and engage in goal-directed behaviour when emotional (see Table 1). Adaptive ER, therefore, depends on the capacity to monitor and experience the full range of emotions. The extent to which these abilities are present permits individuals to respond flexibly when experiencing emotions and to achieve personal goals. The MCER emphasises both adaptive and maladaptive ways of responding to distress, thereby offering clinically useful information about treatment targets (Hallion et al., 2018).

A key component of the MCER's value is the direct operationalisation of the model through the Difficulties in Emotional Regulation Scale (DERS). The DERS is a 36-item self-report measure intended to reflect concepts outlined by the MCER, comprising six subscales (Awareness, Clarity, Nonacceptance, Strategies, Goals,

Impulse). The overall measure demonstrates high internal consistency (α = .93), with each subscale demonstrating adequate internal consistency (α > .80). The DERS also demonstrates high test-retest reliability over a 4–8-week period (ρ_I= .85 = .88, p < .01), and adequate test-retest reliability for subscales (Awareness, ρ_I= .85 = .89, p < .01; Clarity, ρ_I = .80, p < .01; Goals, ρ_I = .57, p < .01; Impulse, ρ_I = .68, p < .01, Nonacceptance, ρ_I = .69, p < .01; Strategies, ρ_I = .89, p < .01). Research relying on clinical populations has since found that a five-factor model, excluding the Awareness subscale, is more robust than a six factor solution (Hallion et al., 2018; Osborne et al., 2017). Consequently, some studies remove the Awareness subscale from analyses, or use the DERS-16 short form, which excludes Awareness items (Victor & Klonsky, 2016).

The DERS also shows evidence of high construct validity, as scores are significantly correlated with measures of experiential avoidance (Acceptance and Action Questionnaire; Bond et al., 2011); emotional expressivity (Emotional Expressivity Scale; Kring et al., 1994); and the perceived ability to manage negative moods (Generalised Expectancy for Negative Mood Regulation Scale; Catanzaro & Mearns, 1990). Positive and significant correlations between the DERS and frequency of deliberate self-harm as a behavioural measure of ER provide support for the predictive validity of the measure. A growing body of research also suggests that improved ER, as measured by the DERS, mediates treatment outcomes (Axelrod et al., 2011; Gratz et al., 2015). As such, the DERS is often used in clinical and research settings to identify ER problems that are relevant to a range of psychopathologies.

Table 1

Description of the Four Constructs Integral to Successful ER According to Gratz and Roemer's (2004) MCER

MCER construct	Corresponding subscale(s) on the DERS	Definition
Awareness and understanding of emotions	Awareness: "I am attentive to my feelings" (reverse scored); "When I'm upset, I acknowledge my emotions" (reverse scored); "When I'm upset, I take time to really figure out what I'm feeling" (reverse scored) Clarity: "I have difficulty making sense out of my feelings", "I have no idea how I'm feeling", "I am confused about how I feel", "I know exactly how I am feeling" (reverse scored)	"Awareness and understanding of emotions" refers to the capacity to acknowledge, value, and make sense of emotional experiences. A restricted capacity to identify emotions diminishes subsequent abilities to modulate emotions, such as selecting more helpful ER strategies and adapting behaviours in response to heightened emotions.
Acceptance of emotions	Nonacceptance: "When I'm upset, I feel ashamed with myself for feeling that way", "When I'm upset, I become angry with myself for feeling that way", "When I'm upset, I feel like I am weak"	"Acceptance of emotions" refers to the capacity to willingly experience emotions and internal states. Willingness to accept emotions facilitates the active monitoring of emotions and is thought to permit more flexible responses to difficult feelings, thoughts, or memories. Inversely, avoidance or over control of negative internal states is thought to lead to greater distress and emotional dysregulation.
Appropriate selection of strategies to regulate emotions	Strategies: "When I'm upset, I believe that I'll end up feeling very depressed", "When I'm upset, I believe that there is nothing I can do to make myself feel better", "When I'm upset, I know that I can find a way to eventually feel better" (reverse scored), "When I'm upset, I believe that wallowing in it is all I can do"	The appropriate selection of strategies refers to an individual's perceived repertoire of effective ER strategies to choose from to modulate the intensity or duration of negative emotions.
Ability to act in a goal-directed way despite emotional states	Goals: "When I'm upset, I have difficulty thinking about anything else", "When I'm upset, I have difficulty concentrating", "When I'm upset, I can still get things done" (reverse scored) Impulse: "When I'm upset, I lose control over my behaviours", "When I'm upset, I feel out of control", "I experience my emotions as overwhelming and out of control"	Successful ER involves modulating the experience of emotional intensity or duration, rather than eliminating the emotion altogether. Successfully modulating emotions and arousal reduces the urgency to act on emotions, in service on long-term goals. The ability to act in a goal-directed way refers to the perceived ability to effectively manage impulsive behaviour in the presence of high emotionality.

1.2 Hoarding and Emotion Regulation Difficulties

By definition, all people with hoarding disorder experience great distress when discarding personal possessions. The way individuals with hoarding experience and respond to emotional distress has thus started to receive attention in the literature. The literature suggests the following ways in which ER problems and hoarding may be linked. Heightened and strong emotions are integral to the CBT model of hoarding (Frost & Hartl, 1996). In the model, beliefs about memory, sentimentality, and responsibility for objects generate strong emotions. These include negative emotions, such as sadness or grief, and positive emotions including pleasure, satisfaction, and a "thrill or buzz" (Taylor, 2017, p. 218). The occurrence of these strong emotions is linked to anticipated, or actual, discarding and acquisition. A shortcoming of the model, however, is that it draws attention to the importance of emotional reactions to possessions but does not take account of the way emotions themselves are experienced or responded to (Campbell-Sills & Barlow, 2007).

A development in the literature suggests that hoarding behaviours themselves may represent attempts to avoid, or down-regulate, negative emotions in the absence of more adaptive ER skills (Worden et al., 2019). For example, the act of saving may represent an attempt to avoid painful feelings of loss or grief (Phung et al., 2015). By the same token, acquisition behaviours possibly represent attempts to down-regulate feelings of regret or sadness at the prospect of *not* acquiring objects (Timpano et al., 2009). Acquisition behaviours may also represent attempts to up-regulate positive emotions such as joy or excitement, which reinforces purchasing or acquisition behaviours (Williams & Grisham, 2012). Individuals with hoarding problems may use acquiring and saving behaviours to avoid negative affect or increase positive affect, reinforcing the use of these behaviours to modulate unwanted or desired emotional states. The use of maladaptive behaviours to

change mood states suggests that underlying difficulties in regulating emotions effectively may be present in this population.

Additionally, strong emotional attachments to objects in the CBT model of hoarding suggests objects may serve an emotionally supportive function to cope with negative feelings. Vulnerability factors for hoarding, such as early experiences of emotional and material deprivation, as well as lack of warmth in families of origin, are thought to shape perceptions of objects as safe and comforting (Kyrios, 2014; Kehoe & Egan, 2019). Research suggests that individuals who experience adversity early in life are vulnerable to difficulties understanding and regulating emotions, as there may be fewer opportunities for caregivers to offer scaffolding for managing emotions in appropriate ways (Heleniak et al., 2016). Children who experience emotional deprivation have been found to engage in more self-comforting strategies to soothe emotions, rather than seek emotional comfort from other people (Kim et al., 2014). In hoarding, individuals might develop safe and comforting relationships with possessions to soothe distress in the absence of relational safety. Anecdotally, hoarded objects have been described as a "fortress", "bunker", or "cocoon", which possibly serve a protective function in response to traumatic life experiences (Steketee & Frost, 2010). Reliance on objects for comfort may therefore represent ER efforts, in the absence of alternative strategies for regulating distress.

To summarise, features of high emotionality, maladaptive use of behaviours to avoid distress, and emotional comfort derived from possessions indicate poor ER may play a role in hoarding difficulties. This paper sought to systematically review ER difficulties in hoarding based on a single conceptualisation of ER to overcome issues of measurement in the field. As this is the first review to study ER in hoarding, Gratz and

Roemer's unified approach to ER is helpful insofar as it organises a range of complex constructs into a single framework, thereby aiding synthesis of findings.

1.3 Aims and Research Questions

The current paper reviewed studies examining the relationship between self-reported difficulties in ER, as operationalised by the DERS, and hoarding symptomatology. The review aims to answer the following questions:

1. Are self-reported difficulties with ER significantly related to the experience of hoarding?
2. Is there evidence that particular dimensions of ER are related to the experience of hoarding?

2 Method

The method and reporting of this review were informed by the Preferred Reporting Items for Systematic Reviews and Meta Analyses guidelines (PRISMA; Liberati et al., 2009).

2.1 Eligibility Criteria

Inclusion criteria were studies that (a) are published in English; (b) measure ER problems using the DERS; (c) use validated psychometric measures to capture hoarding symptom severity, hoarding cognitions and/or hoarding behaviours, or use a diagnostic interview to assess for the presence of hoarding disorder; (d) recruit clinical or non-clinical samples; and (e) are published in peer-review journals or are theses and dissertations. Dissertations were included to reduce risk of publication bias in favour of significant results.

Because of the early stage of the development of this field, eligibility was not restricted on the basis of study design, publication date, and use of clinical or non-clinical samples. Hoarding symptoms and ER problems may exist along a continuum in the general population (Steketee & Frost, 2003; Berking et al., 2014). The inclusion of

studies examining dimensionally-defined hoarding symptoms improves scope for detecting if a relationship exists between hoarding symptoms of ER problems.

The review included studies using the DERS and variations of the DERS. Four variations of the DERS are used in research settings with adults. Two represent shortened versions of the original scale (DERS-18, Victor & Klonsky, 2016; DERS-16, Bjureberg et al, 2016) and two represent state, rather than trait, difficulties in ER (State-DERS, Lavender et al., 2017; DERS-State Version, McLaughlin et al., 2007). State versions of the DERS can be used in experimental designs to assess for ER difficulties following mood inductions.

Papers were excluded (a) if the study was a conference abstract, book chapter or opinion piece, and (b) if participants were below the age of 18. Research suggests that the pre-frontal cortex, thought to be implicated in the ability to regulate and control emotions, is not fully developed in children (Nigg, 2017). The use of cognitive and behavioural strategies to regulate emotions may be affected by reduced executive functioning abilities in children (Zimmermann & Iwanski, 2014). Studies of ER in individuals below 18 were therefore excluded from this review.

2.2 Information Sources and Search

A comprehensive literature search was conducted in September 2020 using PsychINFO, PubMed, Medline, CINAHL, and EMBASE. Terms were searched in the title and key words. A Medical Subject Headings (MeSH) search using the Explode function was used to identify papers. The first group of search terms aimed to identify hoarding symptoms. The second group of search terms aimed to identify difficulties in emotion regulation, as described by Gratz and Roemer (2004). The strategy used across each database was as follows:

Hoard* OR Hoard* disorder OR Hoard* behavio*r OR Diogenes syndrome OR Compulsive hoard* AND Emotion* regulat* OR Emotion* dysregulate* OR Negative mood regulat* OR Mood regulat* OR DERS OR Difficult* in Emotion* Regulat* Scale OR Emotion* aware* OR Emotion* clarity OR Emotion* accept* OR Goals OR Impuls* OR Emotion* Regulat* Strateg*

A secondary search on Google Scholar and an examination of reference lists was completed to ensure a comprehensive search. Finally, a search of the grey literature on the following databases was conducted: OpenGrey, Google, Scopus, UCL Discovery, and OpenDOAR.

2.3 Study Selection

Titles and abstracts were screened by two independent raters to determine if (a) the study measured hoarding symptoms and/or the presence of hoarding disorder and (b) the study assessed ER using the DERS. The second rater screened 100% of the titles and abstracts. There were no conflicts between the two raters in ensuring the studies met eligibility criteria before proceeding to full text extraction ($\kappa = 1.00$). The lead author then screened the full texts to ensure papers met the eligibility criteria. The second rater screened 45% ($n = 15$) of the full texts to ensure papers met eligibility criteria. Perfect inter-rater agreement was achieved ($\kappa = 1.00$).

2.4 Data Extraction

A data extraction form was created to capture (a) study location and quality rating; (b) design and analysis; (c) sample characteristics; (d) measures used to assess for hoarding, (e) which version of the DERS was used; (f) outcomes for the DERS total score and hoarding; and (g) outcomes for the DERS subscales and hoarding. In order to obtain further information for the association between DERS subscale scores and hoarding symptoms, unpublished data were requested from the study authors via email. The second

rater then extracted data from 45% (n = 5) of the papers. Perfect inter-rater agreement was achieved (κ = 1.00).

2.5 Quality Ratings

The papers were assessed for quality using an adapted Checklist for Measuring Quality (Downs & Black, 1998) and The Quality Assessment Tool for Quantitative Studies developed by the Effective Public Health Practice Project (EPHPP, 1998). The adapted tool was created to consider the reliability and validity of results drawn from the papers. The following methodological issues were not applicable to the studies in this review and were removed from the quality appraisal tool: randomisation to treatment condition, compliance with treatment or intervention, blinding of participants to experimental or treatment conditions, and adverse effects of interventions.

Seven domains of methodological quality were appraised, including reporting (/8); outcome measures (/2); selection bias (/7); control for confounding variables (/2); power (/2); analysis (/3); and ethics and service user consultation (/2). An overall quality score out of 26 was assigned to the papers. Higher scores indicated higher methodological quality. Based on the scoring guide, each domain was assigned a score of weak, moderate, or strong. Studies achieved an overall *weak* score if two or more weak ratings were identified, *moderate* if one weak rating was identified, and a *strong* score if there were no weak ratings across domains.

Forty-five percent (n = 5) of the included papers were selected randomly for the second rater to assess methodological quality. Reasons for discrepancy were recorded as (a) oversight; (b) differences in interpretation of criteria; and (c) differences in interpretation of the study. Cohen's κ was run to determine interrater reliability (κ = 0.92).

2.6 Data Synthesis

Findings regarding the relationship between ER and hoarding are summarised via narrative synthesis. Where studies included analyses outside the remit of this review, only the findings of the relevant research questions are reported and discussed.

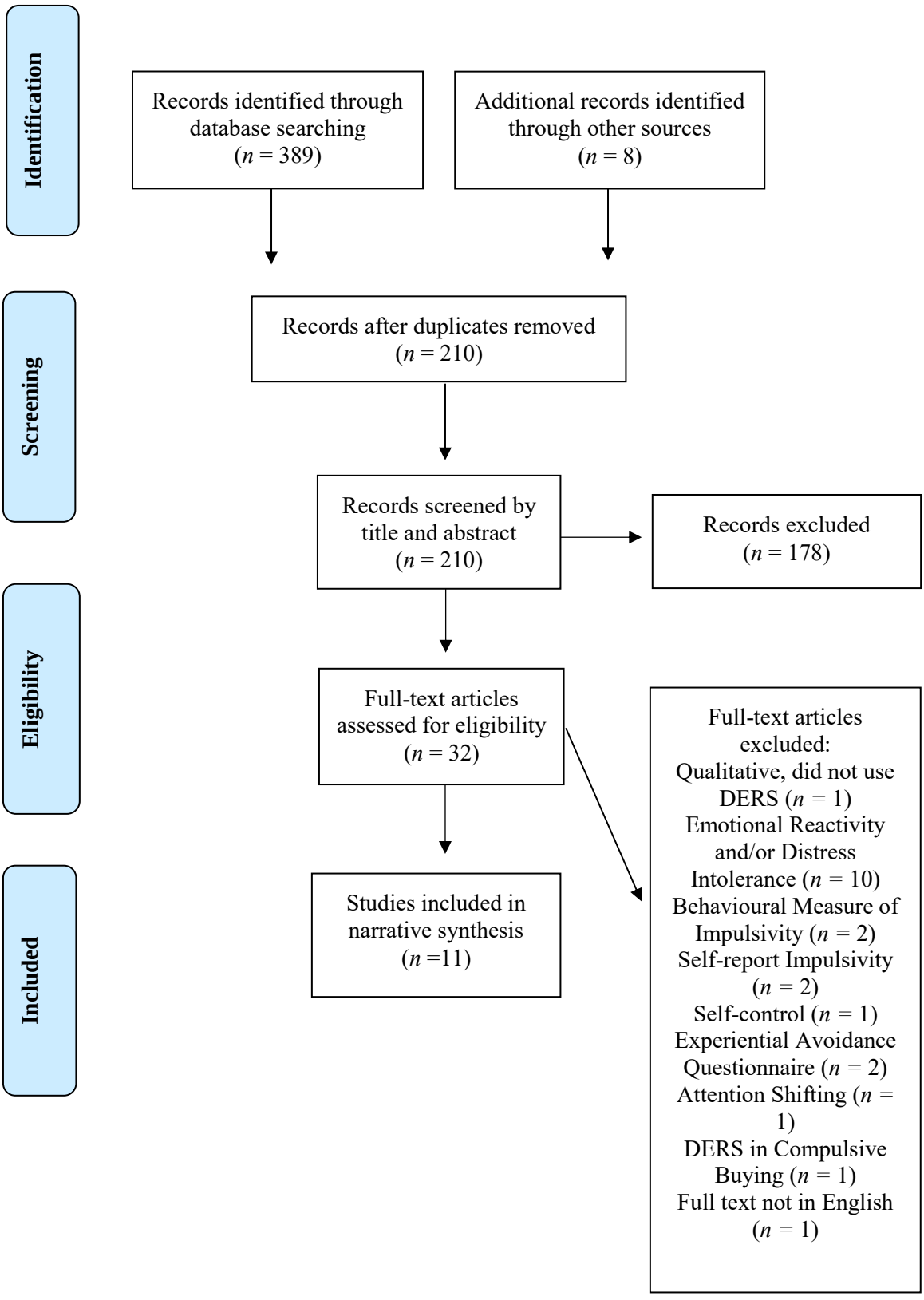
3 Results

3.1 Identification of Studies

A flow chart of the study selection process is presented in Figure 1. An initial search of the databases returned 389 studies. A secondary search of the reference lists and the grey literature identified another eight studies. Once duplicates were removed, 210 papers were reviewed by abstract and title to determine eligibility. A total of 32 papers were then reviewed in full. After applying inclusion and exclusion criteria to the papers reviewed in full, 11 papers were identified for inclusion in the review.

Figure 1

PRISMA Flow Diagram Illustrating the Inclusion and Exclusion of Studies Throughout the Selection Process of this Review



3.2 Study Characteristics

Eleven studies were identified by the search (see Table 2 for study characteristics and Table 3 for a summary of findings). Eight were peer-reviewed articles (1, 2, 4, 5, 7, 8, 9, 11) and three were doctoral theses (3, 6, 10). Studies were published between 2011 and 2019. Quality ratings ranged from weak to moderate, with scores ranging from 12 to 21 out of 26. Six studies were published in the United States of America (1, 2, 6, 8, 9, 11), four in Australia (3, 5, 7, 10), and one in the United Kingdom (4).

Eight studies recruited clinical samples of individuals with hoarding disorder (1, 2, 3, 4, 6, 7, 8, 10). Samples ranged from 11-97 participants, were 61-86% female, 50-89% white, and had a reported mean age of 48.52 (*SD* = 8.90). Three studies recruited non-clinical samples, measuring dimensionally-defined hoarding symptoms (5, 9, 11). Samples in these studies ranged from 199-574 participants, were 54-71% female, 55-85% white, and had a mean age of 33.72 (*SD* = 4.68).

Seven studies aimed to evaluate between-group differences in ER between hoarding groups and healthy controls (HC; 1, 2, 3, 4, 6, 7, 10). Two evaluated between-group differences in ER between hoarding, HC, and clinical control (CC) groups (3, 4). Six studies aimed to evaluate whether hoarding symptoms were correlated with greater ER difficulties (1, 2, 5, 8, 9, 11). One study examined the role of ER as a mediator between hoarding and emotional attachments to possessions (5). One study employed an experimental design to evaluate ER difficulties in hoarding groups following an anxious and relaxed mood induction whilst sorting through possessions (6).

Table 2

Summary of study characteristics including quality ratings, study design, and demographic information

Study ID and Authors	Quality Rating (/26)	Location	Study Design and Analysis	Measurement of Hoarding Symptoms	Size (*n* =)	% Female	Mean Age (SD)	Ethnicity	Mean SI-R Total (SD)
1 Tolin et al., (2018)	Moderate, 21	USA	Between-groups cross-sectional design	DIAMOND SI-R	Hoarding: *n* = 77	86%	54.27 (9.39)	89% White, 3% Hispanic, 8% Nonwhite	61.29 (11.17)
			ANCOVA, Pearson's Correlation		HC: n = 45	73%	53.49 (7.15)	69% White, 9% Hispanic, 22% Nonwhite	8.69 (6.75)
2 Worden et al., (2019)	Moderate, 19	USA	i.Between-groups cross-sectional design	DIAMOND SI-R	Hoarding: n = 87	84%	53.99 (9.24)	Unavailable	Unavailable
			ANCOVA		HC: n = 46	74%	53.33 (7.15)	Unavailable	Unavailable
			ii. Within- groups cross sectional design Hierarchical multiple regression						
3 Grisham et al., (2018)	Moderate, 19	Australia	Between-groups cross-sectional design	HRS-I, SHID, MINI, SI-R	Hoarding: n = 24	67%	40.38 (15.58)	50% White, 33% Asian, 17% Other	54.87 (8.40)
			ANOVA		CC: n = 22	64%	41.00 (13.29)	77% White, 18% Asian, 5% Other	22.23 (9.83)

					HC: n = 26	62%	48.31 (12.28)	73% White, 19% Asian, 8% Other	15.88 (6.30)
4 de la Cruz et al., (2013)	Moderate, 17	UK	Between-groups cross-sectional design ANOVA, independent samples t-tests, Pearson's correlation	MINI, SI-R	Hoarding without OCD: n = 24	83%	56.10 (8.00)	Unavailable	56.20 (15.80)
					Hoarding + OCD: n = 19	80%	47.70 (10.40)		60.30 (14.40)
					OCD without Hoarding: n = 17	59%	46.00 (13.40)		14.20 (12.60)
					HC: n = 20	70%	40.20 (12.10)		14.20 (5.10)
5 Taylor (2017), Study 1	Moderate, 17	Australia	Within- subjects cross-sectional design Pearson's correlation, hierarchical multiple regression	SI-R	Non-clinical sample: n = 199	71%	28.43 (11.42)	Unavailable	18.72 (11.51)
6 Hayward (2011)	Moderate, 16	USA	Between-groups cross-sectional T-tests	ADIS-IV-L, HR-S, SI-R, CIR	Hoarding: n = 21	76%	45.76 (14.20)	81% White, 5% Hispanic, 5% Biracial, 10% Other	57.70 (13.30)
			Within- groups experimental design T-tests		HC: n = 21	76%	46.86 (13.49)	85% White, 5% Asian, 5% Biracial, 5% Other	15.90 (6.24)
7 Baldwin et al., (2019)	Moderate, 15	Australia	Between-groups cross-sectional design ANOVA	MINI, HRS-I	Hoarding: n = 17	47%	48.00 (17.00)	65% White, 35% Asian	49.41 (14.07)
					HC: n = 19	50%	49.00 (9.70)	Unavailable	17.13 (12.24)

8 Raines et al., (2015)	Weak, 15	USA	Within-subjects cross-sectional design Pearson's correlation	SI-R	Hoarding: n = 97	61%	31.94 (11.41)	72% White, 16% Black, 8% Asian, 2% American Indian, 2% Other	53.86 (10.78)
9 Raines et al, (2017)	Weak, 14	USA	Within- subjects cross-sectional design Pearson's correlation	SI-R	Non-clinical sample: n = 574	62%	35.43 (12.57)	84% White, 6% Black, 5% Asian, 5% Other	20.14 (6.46)
10 Taylor (2017), Study 3	Weak, 14	Australia	Between-groups cross-sectional design Independent samples t-test	MINI, SI-R, SCI	Hoarding: n = 11 HC: n = 14	82% No data	57.73 (8.43) 52.36 (5.83)	Unavailable Unavailable	59.73 (18.33) 13.93 (8.74)
11 Mathes et al., (2018)	Weak, 12	USA	Within- subjects cross-sectional design Pearson's correlation	SI-R	Non-clinical sample: n = 258	54%	37.70 (16.04)	55% White, 31% Black, 2% Asian, 11% Other	24.60 (17.53)

Note: HC = healthy control, CC = clinical control, OCD = obsessive compulsive disorder; DIAMOND = Diagnostic Interview for Anxiety, Mood, and Obsessive Compulsive and Related Neuropsychiatric Disorders (Tolin et al., 2018); SI-R = Savings Inventory Revised (Frost et al., 2004); SCI = Savings Cognition Inventory (Steketee et al., 2003); Anxiety Disorders Interview Schedule-IV-Lifetime (ADIS-IV-L; Brown et al.,1994); Hoarding Rating Scale-Interview (HRS-I; Tolin et al., 2010); Structured Interview for Hoarding Disorder (SHID; Nordsletten et al., 2013); Clutter Image Rating (CIR; Frost et al., 2008); Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998).

4 Assessment of Quality and Methodological Critique

4.1 Clarity of Reporting

All studies described clear rationales, aims, and hypotheses. Only two of the study protocols were pre-registered, introducing risk of reporting bias and publication bias (1, 2). Outcome reporting bias can be difficult to detect without pre-registration, even when aims and hypotheses are clearly described (Wager & Williams, 2013). The review aimed to reduce risk of bias in favour of statistically significant outcomes by including grey literature and requesting additional data from researchers. Nonetheless, statistically significant results may be overrepresented in the selected papers. Several studies in the review assessed the relationship between the DERS and hoarding as part of exploratory analyses (6, 7, 8, 9, 10, 11). Whilst this consideration is not a methodological flaw of these studies, this is an issue with the current evidence base for ER and hoarding. It is possible that statistically significantly results were reported or identified by data-dredging.

Six of the 11 studies sufficiently described sample characteristics including age, gender, ethnicity, and hoarding severity (1, 3, 6, 8, 9, 11). Five studies partially described their samples, as ethnicity (4, 5, 7, 10) or sufficient clinical characteristics (2) were not provided. Failure to report information on ethnic background and clinical symptoms limits generalisation of findings to the wider population.

4.2 Outcome Measures

Ten of 11 papers achieved strong ratings for use of outcome measures. These 10 studies included either the 36-item DERS or the DERS excluding the Awareness subscale in analyses. One study achieved a moderate score for using the DERS-State Version (6; McLaughlin et al., 2007). Due to unknown psychometric properties of this measure, both the accuracy and reliability of findings based on this measure should be interpreted with caution.

4.3 Selection Bias

Inclusion and exclusion criteria were partially described in five studies (7, 8, 9, 10, 11), preventing replicability of the study. All but one study (8) recruiting clinical groups used a clinician administered diagnostic interview in addition to a self-report measure of hoarding severity. The use of diagnostic interviews is helpful in describing the sample more accurately. Self-report tools alone offer an indication of whether significant hoarding symptoms are likely. They do not, however, allow for a diagnosis of hoarding or rule out other disorders present with hoarding (Nordsletten et al., 2013). Interviews were conducted by clinicians (2) or doctoral level students trained in use of the measure with supervisory support (1, 3, 4, 6, 7, 10), strengthening the reliability of a hoarding disorder diagnosis.

Representativeness of participants to individuals with hoarding disorder varied across studies. Epidemiological research suggests individuals with hoarding disorder are, on average, 44 years old. Sixty-four percent of known individuals with hoarding are white and hoarding disorder is equally prevalent in men and women (Nordsletten et al., 2013*).* In the eight studies recruiting clinical populations, women were overrepresented compared to the epidemiological data. In non-clinical samples, women were again overrepresented, and participants were significantly younger than average epidemiological data. Ethnicity was not reported in five studies (2, 4, 5, 7, 10) and non-white ethnic groups were collapsed into a single ‘other’ category in two studies (1, 3). These factors limit interpretation of findings to largely Caucasian samples, meaning findings may not be applicable to populations from other ethnic and cultural backgrounds experiencing hoarding problems.

Recruitment methods also varied across studies, impacting the generalisability of findings. One study (5) relied on opportunistic sampling in student populations, resulting in an unrepresentative sample of younger individuals. Most studies relied on sampling requiring self-selection (1, 2, 3, 4, 6, 7, 10). Self-selection in research participation biases the sample

towards individuals who recognise hoarding as a significant problem, limiting the external validity of findings. This is problematic, as more than half of individuals with significant hoarding problems are perceived by loved ones to have little to no insight into the severity of the condition (Tolin et al., 2010). Three studies recruited participants online (8, 9, 11). An online crowdsourcing platform was used in these studies, typically reaching participants who are "educated, middle class, Caucasian and approximately 30 years old" (Raines et al., 2015, p. 30). These recruitment methods can result in research volunteers who differ from clients with hoarding disorder by being younger, representing higher socio-economic brackets, and demonstrating good or fair insight into the severity of their difficulties (Woody et al., 2020).

4.4 Control for Confounding Variables

Two studies achieved strong quality ratings for recruiting matched CC groups (3, 4). Four between-group studies achieved moderate ratings by including matched HCs (1, 2, 6, 7). Matching groups reduces the likelihood that confounding variables, such as depressive symptoms, age, or gender, influence findings in the studies. Controlling for depressive symptoms is important, as elevated levels of depression and anxiety can account for perceived ER difficulties (Joormann & Stanton, 2016). One within-group study achieved a moderate quality rating for controlling for anxiety, depression, and stress as covariates, but not demographic characteristics (5). The remaining studies achieved weak ratings for failing to control for depressive symptomatology and failing to control for demographic variables (8, 9, 10, 11). Failing to control for demographic characteristics like age and gender may be problematic when interpreting findings. There is some evidence to suggest older adults report significantly greater emotional clarity, access to ER strategies, and abilities to manage impulsive behaviours when emotional than younger counterparts (Orgeta, 2009). There is also some suggestion that overall difficulties in ER do not differ between men and women on the DERS. Women, however, may endorse shame and nonacceptance of emotions more than

men, who report taking longer to recover from negative emotional experiences (Anderson et al., 2016). Failure to control for these variables means it is not possible to know from these studies whether demographic factors impact the relationship between ER difficulties and hoarding symptoms.

4.5 Power

All 11 studies received weak ratings for failing to report a power calculation for their studies. Five studies described low sample size as a limitation of their study (3, 4, 6, 7, 10). Studies with low statistical power introduce bias by reducing the chance of detecting a true effect in the data. Low power can also exaggerate effect sizes and reduce predictive value when effects are claimed (Button et al., 2013).

4.6 Analysis

All studies used appropriate statistical tests for parametric and nonparametric data. Multiple comparisons were corrected for in all studies examining post-hoc differences. Nine studies reported effect sizes (1, 2, 3, 5, 7, 8, 9, 10, 11), and two studies provided sufficient data to calculate effect sizes (4, 6). Only two studies included information on how they dealt with missing data (3, 5). There was no comment on missing data in all other studies, making it difficult to conclude whether missing data was an issue that was not addressed, or whether there were no missing data. Missing data can diminish statistical power further and produce biased estimates by reducing the representativeness of the sample (Kang, 2013).

4.7 Ethics and Service User Consultation

Informed consent and ethical approval were sought in all studies. None of the studies reported service user consultation at any stage during the research process. Design and methodology benefit from the involvement of people with lived experience throughout the research process. These individuals are able to offer their perspective on the complex

cognitive, behavioural, and emotional responses that give rise to and maintain hoarding (Orr et al., 2019).

Table 3

Summary of the studies' findings regarding the relationship between ER problems and hoarding

Study ID and Authors	DERS questionnaire used	Confounders Controlled For	Are self-report difficulies with ER significantly related to the experience of hoarding?	Is there evidence that particular dimensions of ER are related to the experience of hoarding?
1 Tolin et al., (2018)	36-items DERS, excluding Awareness in analyses	DASS	The hoarding group reported significantly higher total scores on the DERS compared to the HC group, $\eta_p^2 = .29$ This effect did not remain significant after controlling for depression, anxiety, and stress. After controlling for depression, anxiety, and stress within the hoarding group, the DERS total score was significantly correlated with SI-R acquiring ($r = .29$) and SI-R saving ($r = .26$) but not SI-R clutter.	All subscales of the DERS were significantly higher in the hoarding group than the HC group (η_p^2 values ranged from .13–.31). When controlling for depression, anxiety, and stress, only the *Goals* subscale ($\eta_p^2 = .06$) and the *Clarity* subscale ($\eta_p^2 = .04$) were significantly higher in the hoarding group. After controlling for depression, anxiety, and stress, SI-R saving correlated significantly with *Goals* ($r = .34$), *Clarity* ($r = .23$) and *Strategies (*$r = .21$). SI-R acquiring correlated significantly with *Goals* ($r = .29$), *Clarity* ($r = .26$), and *Strategies* ($r = .23$). SI-R clutter correlated significantly with *Goals* ($r = .27$).
2 Worden et al., (2019)	36-item DERS	DASS	i.The hoarding group reported significantly higher total scores on the DERS compared to the HC group after controlling for depression, anxiety and stress ($\eta_p^2 > .07$)* ii. After controlling for DASS in the hoarding group, the DERS total score significantly predicted SI-R total scores (R^2_{change}=.09), SI-R Acquiring ($R^2_{change} = .13$), SI-R saving ($R^2_{change} = .09$), but not clutter.	i. All subscales of the DERS were significantly higher in the hoarding group than HC group (no effect size offered). After controlling for DASS, DERS *Goals* and *Awareness* remained significantly higher in the hoarding group compared to the HC group ($\eta_p^2 > .07$)* ii.After controlling for DASS in the hoarding group, the SI-R total was predicted by *Goals*, ($R^2_{change} = .10$); Saving was predicted by *Goals*, $R^2_{change} = .12$); Acquiring was predicted by *Goals* ($R^2_{change} = .09$) and *Awareness* ($R^2_{change} = .10$). SI-R clutter was predicted by *Goals* ($R^2_{change} = .07$).
3 Grisham et al., (2018)	36-item DERS	N/A	The hoarding and CC group reported significantly higher DERS total scores than the HC group but were not different from each other ($\eta_p^2 = .59$).	No data available.

4 de la Cruz et al., (2013)	36-item DERS	DY-BOCS	There were significant differences in DERS scores between the four groups, $\eta_p^2 = .41$. All clinical groups obtained higher scores compared to the HC group (effect sizes not reported*). The two hoarding groups differed in terms of ER difficulties. The hoarding + OCD group reported significantly higher DERS scores than the hoarding without OCD group ($d = .75$)	There was no difference between clinical and HC groups on the *Awareness* subscale. All other subscales were higher in clinical groups compared to the HCs (effect sizes not reported*). There was no difference between clinical groups on the *Acceptance*, *Clarity* and *Impulse* subscales*. After controlling for OCD symptoms (DY-BOCS), Pearson's correlation analysis identified that the *Goals* subscale remained modestly and significantly associated with hoarding symptoms, as measured by the SI-R ($r = .27$) and the DY-BOCS hoarding subscale ($r = .27$). The hoarding + OCD group reported significantly higher *Goals* ($d = .79$) and *Strategies* ($d = .70$) scores, compared to hoarding without OCD.
5 Taylor (2017), Study 1	36-item DERS, excluding Awareness in analyses	DASS OCI-R	There was a positive correlation between DERS total and SI-R total after controlling for depression, anxiety and stress ($r = .42$). After controlling for depression and anxiety, DERS total scores were significant predictors of saving ($R^2_{change} = .06$) and acquisition behaviours ($R^2_{change} = .06$) but not clutter. Total DERS scores explain an additional 4% of the variance in hoarding, over and above general depression and non-hoarding OCD symptoms. There was a positive correlation between DERS total score and attachment to possessions after controlling for depression, anxiety and stress ($r = .31$).	Principle Components Analysis (PCA) demonstrated that the theorised six factor solution for the DERS in this sample did not fit the data. For this reason, the authors chose to only analyse the DERS total score, excluding the *Awareness* subscale. There is therefore no data available on DERS subscales in this sample.
6 Hayward (2011)	36-item DERS DERS-State Version	N/A	No data available	Four subscales of the DERS were significantly higher in the hoarding group compared to the HC group, (Strategies: $d = 1.47$; Clarity: $d = 1.08$, Nonacceptance: $d = .95$; Impulse: $d = .92$)

				All subscales, apart from Awareness, were rated significantly higher in the hoarding group compared to the HC group when sorting through personally relevant items (Cohen's *d* ranged from .64–1.31). All subscales on the DERS-state, apart from Awareness and Goals, were rated significantly higher in the hoarding group compared to the HC group when sorting through non-personally relevant items (Cohen's *d* ranged from .87 –1.36). Clarity (*d* = .38) and Impulses (*d* = .25) were rated higher on the DERS-state when sorting through personally relevant items when anxious, compared to sorting through non-personally relevant items when relaxed in those with hoarding disorder.
7 Baldwin et al., (2019)	36-item DERS	N/A	The hoarding group reported significantly higher DERS total scores than the HC participants (η_p^2 = .16).	No data available due to deletion of data in line with ethics guidelines.
8 Raines et al., (2015)	36-item DERS	N/A	The DERS total score was significantly correlated with SI-R total scores (*r* = .41) and SI-R Acquisition (*r* = .52) but not SI-R Saving or SI-R Clutter.	No data available.
9 Raines et al., (2017)	36-item DERS	N/A	The DERS total score was significantly correlated with the SI-R total score (*r* = .53)	No data available.
10 Taylor (2017, Study 3	36-item DERS, excluding Awareness in analyses	N/A	There was no significant difference between the hoarding and HC groups for the DERS total score (*d* = .69).	No data available.
11 Mathes et al., (2018)	36-item DERS	N/A	The DERS total score was correlated significantly with SI-R total (*r* = .39), saving (*r* = .39), excessive acquisition (*r* = .39) and clutter (*r* = .27).	The *Awareness* subscale was not significantly correlated with the SI-R total or SI-R subscales. SI-R Discarding was significantly correlated with *Impulse* (*r* = .41), *Strategies* (*r* = .39), *Nonacceptance* (*r* = .28), *Goals* (*r* = .25) and *Clarity* (*r* = .22).

	SI-R Acquisition was significantly correlated with *Impulse* (r = .40), *Strategies* (r = .38), *Nonacceptance* (r = .29), *Goals* (r = .25) and *Clarity* (r = .23). SI-R Clutter was significantly correlated with *Strategies* (r = .29), *Goals* (r = .24), *Impulse* (r = .22), *Nonacceptance* (r = .19) and *Clarity* (r = .15).

**Exact statistics not reported in paper*

Note: HC = healthy control, CC = clinical control, OCD = obsessive compulsive disorder; DERS-State Version (DERS-S; McLaughlin et al., 2007); Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995); Dimensional Yale-Brown Obsessive Compulsive Scale (DY-BOCS; Rosario-Campos et al., 2006); Obsessive Compulsive Inventory-Revised (OCI-R; Foa et al., 2002)

5 Narrative Synthesis

5.1 Question 1: Are Self-Reported Difficulties with ER Significantly Related to the Experience of Hoarding?

5.1.1 Findings from Between-Groups Research

Compared with HCs, individuals with hoarding disorder report more problems with ER. Of the six studies that aimed to establish whether the DERS total scores were elevated in hoarding disorder (1, 2, 3, 4, 7, 10), five showed that difficulties regulating emotions were significantly higher in hoarding groups compared with HCs. Medium (2) to large effect sizes (1, 3, 4, 7) were reported. Two of these studies (1, 2) controlled for mood and anxiety, offering inconsistent evidence as to whether depression or anxiety accounted for the ER problems observed. One (1) identified that these factors accounted for group differences in ER difficulties between HCs and individuals with hoarding. The other (2) found that even after controlling for depression and anxiety, the hoarding group reported significantly higher ER difficulties compared to HCs. Replication of these finding in well-controlled studies is needed to clarify whether symptoms of depression and anxiety account for ER problems observed in the hoarding groups.

Other studies suggest that ER problems are not diagnostically specific to hoarding disorder. Two studies comparing the DERS across hoarding, HC, and CC groups found evidence to suggest that both clinical groups experienced elevated difficulties in ER compared with HCs (3,4). ER difficulties, however, were not different between hoarding groups and mixed CC groups (3) or between hoarding groups and those with OCD (4). When hoarding and OCD co-occur, even higher levels of ER difficulties are experienced relative to hoarding alone or OCD alone (4). This suggests that a comorbid diagnosis of hoarding and OCD is associated with worse ER difficulties than hoarding alone.

Only one of the six studies comparing DERS scores between hoarding and HC groups did not find evidence of group differences in the perceived ability to regulate emotions (10). The findings of this study should be interpreted with caution as the study achieved the lowest quality rating of the six studies relying on criterion groups. The weight of the evidence from studies recruiting hoarding, CC, and HC samples suggests difficulties regulating emotions are relevant, but not specific, to the experience of hoarding.

5.1.2 Findings from Correlational Research

The six studies (1, 2, 5, 8, 9, 11) that analysed the association between the DERS and hoarding severity found a significant, positive relationship between these variables. Small to medium effect sizes were reported for the correlations between hoarding severity and ER problems. In studies controlling for symptoms of depression, anxiety and non-hoarding OCD, ER difficulties remained significantly correlated with hoarding symptoms, yielding small to medium effect sizes (1, 2, 5).

In addition to overall hoarding symptom severity, five studies analysed the correlation between the DERS total scores and the SI-R subscales of acquisition, saving, and clutter (1, 2, 5, 8, 11). All five studies found a significant relationship between the DERS and acquisition behaviours, yielding small to medium effect sizes. Four studies reported significant relationships between the DERS and saving behaviours, yielding small to medium effect sizes (1, 2, 5, 11). After controlling for mood and anxiety, difficulties in ER accounted for 6.3-13% of the variance in excessive acquisition behaviours, and 6–9% of the variance in saving behaviours (2, 5). Only one of the five studies found a significant but small correlation between the DERS and the clutter subscale (11). This study did not control for depression and anxiety and the relationship could possibly be accounted for by general levels of negative affect. Together, these findings suggest that ER difficulties are modestly associated with

acquisition and saving behaviours above and beyond the effects of mood and anxiety. Clutter, on the other hand, is less robustly associated with difficulties regulating emotions.

One study analysed the relationship between DERS total score and emotional attachments to possessions (5). A small but positive correlation between the DERS and emotional attachments to possessions was identified, after controlling for mood and anxiety. Emotional attachments to possessions partially mediated the relationship between difficulties in ER and hoarding symptom severity. These findings suggest that hoarding severity is influenced by the presence of ER difficulties, mediated by disorder-specific beliefs about the comfort derived from objects. These findings should be interpreted tentatively, however, as no other studies in the review assessed difficulties in ER and cognitions in hoarding. The study also recruited an unrepresentative sample of predominantly female, white, and young undergraduate students without clinical symptoms of hoarding disorder. This limits the external validity of the findings.

5.2 Question 2: Is There Evidence That Particular Dimensions of ER are Related to the Experience of Hoarding?

Five studies provided sufficient data to answer the second question of this review (1, 2, 4, 6, 11).

5.2.1 Findings from Between-Groups Research

There was limited evidence to suggest the Awareness subscale was robustly associated with hoarding. Two studies found that all dimensions of ER difficulties, apart from Awareness, were more problematic in hoarding groups compared to HCs (4, 6). One study (2) identified that poorer awareness of emotional experiences was significantly more problematic in hoarding groups compared to HCs, yielding a small effect size. Together, these findings suggest lack of emotional awareness is not strongly associated with hoarding. Emotional clarity (Clarity), on the other hand, was identified as poorer in hoarding groups

compared to HCs (2, 4, 6), even after controlling for depression and anxiety (1). Both the Awareness and Clarity subscales form part of a broader construct referring to the overall capacity to acknowledge, value, and make sense of emotional experiences. Regarding this first MCER construct, findings suggest that difficulties making sense of emotional experiences (i.e., Clarity: "I am confused about how I feel; I have no idea how I feel") are more pronounced in hoarding compared to not being aware of feelings (i.e., Awareness: "When I'm upset, I do not acknowledge my emotions; I do not pay attention to how I feel").

Acceptance of emotional experiences (Nonacceptance) and appropriate selection of strategies to regulate emotions (Strategies) were also identified as poorer in the hoarding groups compared to HC groups in four studies (1, 2, 4, 6). These findings suggest that individuals with hoarding experience a tendency to (a) avoid or over-control negative internal states and (b) perceive themselves to have fewer effective strategies for managing negative emotions. After controlling for mood and anxiety, however, these effects were no longer significant, implying these facets of ER may be accounted for by low mood and anxiety (1, 2).

Finally, three of four studies identified that difficulties engaging in goal-directed behaviour (Goals) and controlling impulses (Impulses) when emotional were perceived as more problematic in hoarding groups compared to HCs (1, 2, 4). Goals and Impulse subscales form part of a broader MCER construct related to the ability to act in accordance with personal goals, despite emotional states. Even after accounting for depression and anxiety (1, 2), the Goals subscale was significantly higher in hoarding groups compared to HCs. Medium effect sizes were reported. Compared to individuals with OCD alone or hoarding disorder alone, individuals with comorbid OCD and hoarding reported significantly higher scores on the Strategies and Goals subscales (4). Medium to large effect sizes were reported respectively. These findings suggest that individuals with comorbid diagnoses of hoarding

and OCD may have poorer access to strategies for regulating emotions and experience heightened difficulties controlling behaviour when emotional.

Only one of the four studies (6) did not find evidence for significantly higher Goals scores between hoarding and HC groups after controlling for multiple comparisons. The study, however, was not powered to detect between-groups differences on DERS subscales. It is possible that between-groups differences existed on the Goals subscale but the study was not sufficiently powered to detect an effect. The findings from this study should therefore be interpreted with caution.

Taken together, these findings suggest that hoarding is associated with the DERS subscales of Clarity, Nonacceptance, Strategies, Impulses and Goals. There is less evidence to suggest Awareness is strongly associated with hoarding. After controlling for symptoms of depression and anxiety, the Goals subscale is most consistently associated with hoarding.

5.2.2 Findings from Correlational Research

Three studies (1, 2, 11) analysed the correlations between DERS subscale data and the SI-R subscales of acquisition, saving, and clutter. There was limited evidence from the correlational research to suggest Awareness and hoarding symptoms were linked (1, 11), apart from excessive acquisition in one instance (2). Outcomes of the correlational research also support findings identified by studies relying on criterion groups, suggesting that the remaining DERS subscales are associated more strongly with acquisition and saving behaviours than with clutter. When mood and anxiety were *not* controlled for, medium to large effect sizes were observed for the positive correlation between Impulse and Strategies subscales in relation to saving and acquisition behaviours (11). This suggests that problems controlling impulses when emotional and having a paucity of ER strategies to feel better is associated with compulsive saving and acquisition behaviours. Goals, Clarity, and Nonacceptance subscales yielded small to medium correlations with acquisition and saving

behaviours (1, 2). Clutter was only modestly associated with all subscales of the DERS, apart from Awareness. When mood and anxiety *were* controlled for, all three hoarding subscales (saving, acquisition, clutter) remained significantly correlated with the Goals subscale only (1, 2). Goals predicted 12% of the variance in saving, 9% in acquisition, and 7% with clutter (2). These findings suggest that hoarding behaviours may reflect underlying difficulties engaging in goal-directed behaviour when emotional.

Overall, the Goals subscale was most consistently identified as remaining associated with hoarding symptoms in studies controlling for symptoms of anxiety, depression, and OCD (1, 2, 4). Small to medium effect sizes were yielded. There was inconsistent evidence, however, to suggest that other DERS subscales were associated with hoarding symptoms after controlling for confounding variables. The remaining DERS subscales were not significantly correlated with hoarding symptoms after controlling for mood, anxiety, and OCD in two studies (2, 4). One study identified that Clarity and Strategies remained positively associated with SI-R scores (1). DERS subscales of Awareness, Impulse, and Nonacceptance, however, were not identified by studies 1, 2, or 4 to be significantly correlated with hoarding after controlling for confounders.

5.2.3 Findings from Experimental Research

One study employed an experimental design to assess whether a sorting task in an anxious mood induction was associated with ER problems in hoarding compared to in HCs (6). The experimental study potentially provides some insight into the directional relationship between ER and hoarding. Individuals were asked to categorise (a) personally relevant items when feeling anxious; (b) personally relevant items when feeling relaxed; and (c) non-personally relevant items when relaxed (6). Compared to HCs, individuals with hoarding disorder reported greater emotional dysregulation on every subscale, apart from Awareness, when sorting through personally relevant items. Compared to HCs, individuals with hoarding

reported higher DERS subscale scores, apart from Awareness and Goals, when sorting through non-personally relevant items. This finding suggests that individuals with hoarding disorder demonstrate comparable ability to HCs in the perceived ability to engage in goal-directed behaviour when sorting through items without personal meaning. When items become personally meaningful, however, problems engaging in goal-directed behaviour appear to be more problematic in those with hoarding disorder. These scores, however, possibly reflect between-group differences on Awareness and Goals subscales identified by the trait DERS. Failure to measure baseline DERS-State scores before experimental conditions reduces the ability to draw firm conclusions about between-groups differences in response to the experimental manipulation.

In the hoarding group only, ER problems in response to relaxed or anxious conditions were then examined. Findings suggest that individuals with hoarding disorder experienced increased difficulties (a) knowing which emotions were being experienced in any given moment (Clarity) and (b) controlling impulsive behaviours (Impulse) when anxious. These findings indicate that emotional clarity and the ability to control impulses are affected by negative emotional states in those with hoarding, compared to relaxed states. Conclusions drawn from this study should be interpreted tentatively, as the within-subjects analysis relied on a small sample of individuals with hoarding. Analyses also relied on McLaughlin and colleagues' (2007) state version of the DERS without established psychometric properties. The study has not been replicated using similar methodology or design.

6 Discussion

6.1 Summary of Findings

This review aimed to identify if ER difficulties, as operationalised by the DERS, are related to the experience of hoarding. There was robust evidence to suggest that overall difficulties in regulating emotions are associated with hoarding problems. There was also

evidence to suggest the DERS subscales of Clarity, Nonacceptance, Strategies, Goals, and Impulses are associated with hoarding problems. There was limited evidence to suggest poor awareness (Awareness) of emotions is associated with hoarding. Hence, hoarding was associated with problems regarding (a) the ability to recognise and understand emotions; (b) willingness to tolerate unwanted emotions; (c) access to a range of effective ER strategies; and (d) the ability to engage in goal-directed behaviour when emotional. Of these problems, difficulty engaging in goal-directed behaviour when emotional was most consistently highlighted as associated with hoarding beyond symptoms of depression and anxiety.

6.2 Theoretical Implications

The reviewed studies provide reasonable evidence to suggest that at least some of the relationship between ER difficulties and hoarding can be accounted for by anxiety and depression. Given the established links between ER problems, depression, and anxiety, it is unsurprising that these symptoms account for some ER problems observed (Mennin et al., 2005). Furthermore, many of the ER problems seen in hoarding were shared with other psychiatric populations in this review (Grisham et al., 2018; de la Cruz et al., 2013). The lack of diagnostic specificity identified by this review regarding ER and hoarding would be consistent with the research identifying ER as a transdiagnostic feature of various mental health conditions (Sloan et al., 2017).

Similar to conceptualisations of ER in the maintenance of other emotional disorders, broad difficulties in the ability to tolerate and accept emotions may prompt the use of avoidance behaviours to manage distress (Roemer et al., 2009). The reviewed studies suggest an ER framework may reasonably be applied to the phenomenology of hoarding in the following respects. Regarding hoarding behaviours, ER difficulties were linked to acquisition and saving behaviours. These findings support the conceptualisation of acquisition and saving behaviours as strategies for ameliorating negative affect or increasing positive affect. Clutter,

on the other hand, more likely represents an outcome of these behaviours and may be less strongly motivated by emotional states. These findings support the notion that acquisition and saving behaviours possibly fulfil an emotional regulatory function for those who struggle to tolerate emotional states, and do not possess a wide range of alternative ER strategies (Worden et al., 2019).

There was also evidence to link ER problems with specific hoarding cognitions. Emotional attachments to objects was found to mediate the relationship between ER problems and hoarding severity (Taylor, 2017). The results of this study tentatively support the assertion that emotional attachments serve an emotionally comforting function for individuals who struggle to regulate emotions by other means (Phung et al., 2015). Despite this link, it is unclear what processes or circumstances give rise to emotional attachments as a mechanism for managing unwanted emotions. Replication of this finding, including longitudinal research, is required to describe the direction of this relationship.

In regard to specific DERS subscales, this review identified that poor emotional awareness is not strongly associated with hoarding problems. Research suggests individuals with hoarding may instead be highly aware and sensitive to emotional experiences, leading to greater attempts to control or regulate emotions (Timpano et al., 2009). Greater sensitivity and fear of body sensations may result in the use of avoidance-based strategies to manage distress (Timpano et al., 2014). Alternatively, poor construct validity of the Awareness subscale on the DERS could reasonably account for the lack of association between emotional awareness and hoarding. This explanation would be consistent with research suggesting that the Awareness subscale has poor factor structure in populations experiencing mental ill health (Osborne et al., 2017). Regardless, lack of emotional awareness as measured by the DERS does not appear to be robustly linked to hoarding.

Of the remaining DERS subscales, the Goals subscale was most strongly and consistently associated with hoarding, above and beyond the effects of mood. The inability to resist urges when emotional is consistent with the qualitative literature on hoarding and ER. The literature suggests individuals find it difficult to resist acquiring or saving objects in the moment, despite being aware of the long-term consequences of using objects to manage emotions (Taylor, 2017). One possible explanation for elevated scores on the Goals subscale is that the scores may reflect information processing deficits associated with hoarding disorder (McMillan et al., 2013). Information processing issues like sustaining attention, planning, and problem solving may account for some responses to the Goals subscale captured by the DERS (i.e., "When I'm upset, I have difficulty concentrating"; "When I'm upset, I have difficulty focusing on other things"; "When I'm upset, I have difficulty getting work done"). It is also possible that information processing deficits could be exacerbated by intense or poorly regulated emotions triggered by discarding or acquisition (Gledhill et al., 2020).

In summary, a number of studies suggest self-reported ER difficulties are associated with the presence of hoarding disorder and hoarding symptoms. Due to the paucity of experimental and longitudinal studies identified, findings from cross-sectional research in this field have thus far failed to provide evidence for a causal link between ER and hoarding. It remains to be known what processes result in the use of objects to manage emotions, instead of other behavioural strategies for managing emotions.

6.3 Clinical Implications

Traditionally, CBT treatments focus on the cognitive and behavioural processes involved in the maintenance of hoarding but do not explicitly target ER problems (Steketee & Frost, 2013). As a transdiagnostic intervention, ER skills training (ER-ST) can enhance CBT response rates by 10% and remission rates by 14% in depressed patients (Berking et al.,

2013). ER-ST interventions explicitly aim to improve skills for adaptively coping with unwanted emotions, rather than focusing on cognitive or behavioural antecedents of distress. This approach to treatment addresses a number of ER concerns identified as associated with the experience of hoarding in this review, such as poor understanding of emotions, lack of adaptive ER skills and nonacceptance of emotions. The review identified that individuals with hoarding disorder may experience heightened difficulties understanding emotions and controlling behaviours when anxious (Hayward, 2011). The application of these skills in vivo, such as during discarding tasks, may be particularly relevant for those with hoarding.

The review identified that at least some of the relationship between ER and hoarding may be accounted for by depression and anxiety, which are highly comorbid with hoarding disorder (Frost et al., 2015). Providing clients with a range of ER skills necessary to cope with various kinds of distress can be an efficacious way of approaching psychological treatments for clients who experience high rates of comorbidity, rather than trialling several disorder-specific interventions (Berking & Lukas, 2015). The assessment and treatment of ER difficulties may also be particularly relevant for individuals with comorbid OCD and hoarding, who possibly represent a group with heightened vulnerability to ER difficulties and distress (de la Cruz et al., 2013).

6.4 Research Implications

The review identified a need to replicate findings in well-controlled and sufficiently powered studies. Research aiming to enhance the current understanding of ER and hoarding across cultures is needed, as studies were limited to exploring these phenomena across three countries only. Overreliance on cross-sectional design in the review limits findings to describing an association between ER difficulties and hoarding. Prospective and longitudinal research is needed to provide more information on the causal pathways leading to maladaptive behaviours and emotional attachments to possessions. Given the frequency with

which comorbidity is present in those with hoarding disorder, the consistent inclusion of depression and anxiety measures as covariates is needed to further understand the extent to which ER deficits are specifically associated with hoarding disorder.

Experimental research is needed to clarify the relationship between ER problems and executive functioning problems in hoarding, including inhibitory control, task switching, and sustained and divided attention (Gledhill et al., 2020). Performance on neuropsychological tasks of executive function under stress compared to neutral conditions may clarify the extent to which true cognitive impairments are affected by problems tolerating and regulating intense emotions. Use of a validated and reliable tool in experimental research using mood inductions, such as the State-DERS (Lavender et al., 2017), is needed for experimental design.

Regarding particular ER difficulties, there was limited evidence to suggest that lack of emotional awareness is associated with hoarding. An exploration of anxiety sensitivity in the hoarding literature may provide further information on how individuals with hoarding attend to physiological sensations related to distress. It is possible, however, that the poor construct validity of the Awareness subscale on the DERS accounts for the observed lack of association. Further exploration of the factor structure of the DERS in hoarding populations would help to determine whether lack of construct validity accounts for these findings.

6.5 Limitations of the Review

This review should be considered with regards to its limitations. No restrictions were placed on date of publication or inclusion of clinical and non-clinical populations. Findings drawn from studies recruiting non-clinical groups and those relying on criteria that pre-date hoarding as a distinct diagnostic category may not be strongly representative of individuals meeting present DSM-5 criteria.

The MCER is not the only model of ER that could be used to organise ER strategies in a review. A single ER framework, chosen for the pragmatic reason of frequency of use in the hoarding literature, was used in this review to describe a limited set of constructs related to ER. This approach overcomes issues of heterogeneity regarding ER measurement, design, and methodology in studies, which can affect the ability to synthesise data. However, reliance on one conceptualisation of ER in the present review means it is not possible to comment on whether aspects of ER defined by other models are relevant to hoarding. For example, distinct but related constructs such as distress tolerance, emotional reactivity and alexithymia, have been identified as relevant to the experience of hoarding (Norberg et al., 2020; Shaw et al., 2015; Timpano et al., 2009). Reliance on the DERS as a single tool for measuring constructs under the MCER furthermore constrains the review's findings to the interpretability of one measure only. Self-report measures exist that capture similar constructs put forth by Gratz and Roemer, such as the Acceptance and Action Questionnaire (AAQ; Bond et al., 2011), which may be relevant for measuring issues related to 'Nonacceptance' of emotions, or the Toronto Alexithymia Scale (TAS; Bagby, Taylor & Parker, 1994), which could extend the current understanding of problems relating to emotional 'Clarity'. Finally, additional strategies integral to ER, including expressive suppression and cognitive reappraisal, are not captured by the DERS. The Emotion Regulation Questionnaire (ERQ; Gross, 2003) is a psychometrically sound tool for measuring these facets of ER. Whilst the ERQ is used extensively in studies of depression and anxiety, it is used too infrequently in the hoarding literature to justify a systematic review at this stage. Nonetheless, further consideration of constructs related to ER may extend our current understanding of processes relevant to hoarding.

Another limitation of the MCER is that the DERS provides information on conscious ER processes involved in modulating the intensity or duration of emotional experiences. A

focus on conscious ER processes is a limitation of self-report measures of ER generally, as individuals who experience diminished understanding of their emotions may also experience reduced insight into the processes used to regulate emotions. Introspective ability, as well as other response biases such as demand characteristics, are limitations of relying on self-report measures alone. The inclusion of physiological measures and behavioural paradigms can provide useful information on nonconscious ER strategies, as well as identify which physiological or emotional experiences precede the use of ER strategies (Bridges et al., 2004).

These limitations notwithstanding, this paper represents the first to synthesise the evidence investigating the relationship between self-reported ER problems and hoarding, as operationalised by a single empirical framework. Findings from this review contribute to knowledge about processes relevant to the maintenance of hoarding problems and provide evidence that specific ER problems are related to hoarding.

7 Conclusion

The review identified that ER difficulties are associated with the experience of hoarding. Reviewed studies suggest ER difficulties likely represent a shared feature of emotional disorders, including hoarding disorder. Irrespective of whether mood and anxiety account for ER difficulties in hoarding, interventions designed to support individuals with hoarding problems overcome maladaptive ways of experiencing and responding to emotions could be helpful. Prospective and longitudinal research is needed to facilitate a better understanding of the mechanisms and causal pathways leading to maladaptive hoarding behaviours and cognitions.

Acknowledgments: None.

References

Aldao, A., Gee, D. G., De Los Reyes, A., & Seager, I. (2016). Emotion regulation as a transdiagnostic factor in the development of internalizing and externalizing psychopathology: Current and future directions. *Development and Psychopathology*, *28*(4pt1), 927–946. http://doi:10.1017/S0954579416000638

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, *30*(2), 217–237. https://doi.org/10.1016/j.cpr.2009.11.004

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Anderson, L. M., Reilly, E. E., Gorrell, S., Schaumberg, K., & Anderson, D. A. (2016). Gender-based differential item function for the difficulties in emotion regulation scale. *Personality and Individual Differences*, *92*, 87–91. https://doi.org/10.1016/j.paid.2015.12.016

Axelrod, S. R., Perepletchikova, F., Holtzman, K., & Sinha, R. (2011). Emotion regulation and substance use frequency in women with substance dependence and borderline personality disorder receiving dialectical behavior therapy. *The American Journal of Drug and Alcohol Abuse*, *37*(1), 37–42. https://doi.org/10.3109/00952990.2010.535582

Bagby, R. M., Taylor, G. J., & Parker, J. D. (1994). The twenty-item Toronto Alexithymia Scale—II. Convergent, discriminant, and concurrent validity. *Journal of Psychosomatic Research*, *38*(1), 33-40. https://doi.org/10.1016/0022-3999(94)90006-X

Baldwin, P. A., Whitford, T. J., & Grisham, J. R. (2019). Emotion sensitivity of the error-related negativity in hoarding individuals. *Journal of Psychopathology and Behavioral Assessment*, *41*(4), 589–597. https://doi.org/10.1007/s10862-018-09716-9

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II*. Psychological Corporation.

Berking, M., & Lukas, C. A. (2015). The Affect Regulation Training (ART): A transdiagnostic approach to the prevention and treatment of mental disorders. *Current Opinion in Psychology*, *3*, 64–69. https://doi.org/10.1016/j.copsyc.2015.02.002

Berking, M., & Wupperman, P. (2012). Emotion regulation and mental health: Recent findings, current challenges, and future directions. *Current Opinion in Psychiatry*, *25*(2), 128–134. doi:10.1097/YCO.0b013e3283503669

Berking, M., Ebert, D., Cuijpers, P., & Hofmann, S. G. (2013). Emotion regulation skills training enhances the efficacy of inpatient cognitive behavioral therapy for major depressive disorder: A randomized controlled trial. *Psychotherapy and Psychosomatics*, *82*(4), 234–245. https://doi.org/10.1159/000348448

Berking, M., Wirtz, C. M., Svaldi, J., & Hofmann, S. G. (2014). Emotion regulation predicts symptoms of depression over five years. *Behaviour Research and Therapy*, *57*, 13–20. https://doi.org/10.1016/j.brat.2014.03.003

Bjureberg, J., Ljótsson, B., Tull, M. T., Hedman, E., Sahlin, H., Lundh, L. G., & Gratz, K. L. (2016). Development and validation of a brief version of the Difficulties in Emotion Regulation Scale: the DERS-16. *Journal of Psychopathology and Behavioral Assessment*, *38*(2), 284–296. https://doi.org/10.1007/s10862-015-9514-x

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K. & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire–II: A revised measure of psychological inflexibility and

experiential avoidance. *Behavior Therapy*, *42*(4), 676–688. https://doi.org/10.1016/j.beth.2011.03.007

Bridges, L. J., Denham, S. A., & Ganiban, J. M. (2004). Definitional issues in emotion regulation research. *Child Development*, *75*(2), 340–345. https://doi.org/10.1111/j.1467-8624.2004.00675.x

Brown, T. A., Barlow, D. H., & DiNardo, P. A. (1994). *Anxiety disorders interview schedule adult version: Client interview schedule*. Graywind Publications Incorporated.

Button, K. S., Ioannidis, J. P., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S., & Munafò, M. R. (2013). Power failure: Why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience*, *14*(5), 365–376. https://doi.org/10.1038/nrn3475

Campbell-Sills, L., & Barlow, D. H. (2007*). Incorporating emotion regulation into conceptualizations and treatments of anxiety and mood disorders*. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 542–559). Guilford Press. https://doi.org/10.1016/0022-4596(78)90152-4

Catanzaro, S. J., & Mearns, J. (1990). Measuring generalized expectancies for negative mood regulation: Initial scale development and implications. *Journal of Personality Assessment*, *54*(3–4), 546–563. https://doi.org/10.1080/00223891.1990.9674019

de la Cruz, L. F., Landau, D., Iervolino, A. C., Santo, S., Pertusa, A., Singh, S., & Mataix-Cols, D. (2013). Experiential avoidance and emotion regulation difficulties in hoarding disorder. *Journal of Anxiety Disorders*, *27*(2), 204–209. https://doi.org/10.1016/j.janxdis.2013.01.004

Downs, S. H., & Black, N. (1998). The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of

health care interventions. *Journal of Epidemiology & Community Health*, *52*(6), 377–384. http://dx.doi.org/10.1136/jech.52.6.377

Effective Public Healthcare Panacea Project (1998). *The quality assessment tool for quantitative studies*. https://www.ephpp.ca/PDF/Quality%20Assessment%20Tool_2010_2.pdf Accessed 12/10/2020

Etkin, A., Büchel, C., & Gross, J. J. (2015). The neural bases of emotion regulation. *Nature Reviews Neuroscience*, *16*(11), 693-700. https://doi.org/10.1038/nrn4044

Frost, R. O., & Hartl, T. L. (1996). A cognitive-behavioral model of compulsive hoarding. *Behaviour Research and Therapy*, *34*(4), 341–350. https://doi.org/10.1016/0005-7967(95)00071-2

Frost, R. O., Steketee, G., & Grisham, J. (2004). Measurement of compulsive hoarding: Saving inventory-revised. *Behaviour Research and Therapy*, *42*(10), 1163–1182. https://doi.org/10.1016/j.brat.2003.07.006

Frost, R. O., Steketee, G., & Tolin, D. F. (2015). Comorbidity in hoarding disorder. *Focus*, *13*(2), 244–251. https://doi.org/10.1176/appi.focus.130218

Frost, R. O., Steketee, G., Tolin, D. F., & Renaud, S. (2008). Development and validation of the clutter image rating. *Journal of Psychopathology and Behavioral Assessment*, *30*(3), 193–203. https://doi.org/10.1007/s10862-007-9068-7

Gledhill, L. J., Bream, V., Drury, H., & Onwumere, J. (2020). Information processing in hoarding disorder: A systematic review of the evidence. *Journal of Affective Disorders Reports*, 100039. https://doi.org/10.1016/j.jadr.2020.100039

Gratz, K. L., Bardeen, J. R., Levy, R., Dixon-Gordon, K. L., & Tull, M. T. (2015). Mechanisms of change in an emotion regulation group therapy for deliberate self-

harm among women with borderline personality disorder. *Behaviour Research and Therapy*, *65*, 29–35. https://doi.org/10.1016/j.brat.2014.12.005

Gratz, K. L., Conrad, S. D., & Roemer, L. (2002). Risk factors for deliberate self-harm among college students. *American Journal of Orthopsychiatry*, *72*(1), 128–140. https://doi.org/10.1037/0002-9432.72.1.128

Gratz, K. L., & Roemer, L. (2004). Multidimensional Assessment of Emotion Regulation and Dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, *26*(1), 41–54. https://psycnet.apa.org/doi/10.1023/B:JOBA.0000007455.08539.94

Grisham, J. R., Martyn, C., Kerin, F., Baldwin, P. A., & Norberg, M. M. (2018). Interpersonal functioning in hoarding disorder: An examination of attachment styles and emotion regulation in response to interpersonal stress. *Journal of Obsessive-compulsive and Related Disorders*, *16*, 43–49. https://doi.org/10.1016/j.jocrd.2017.12.001

Hallion, L. S., Steinman, S. A., Tolin, D. F., & Diefenbach, G. J. (2018). Psychometric properties of the Difficulties in Emotion Regulation Scale (DERS) and its short forms in adults with emotional disorders. *Frontiers in Psychology*, *9*, 539. https://doi.org/10.3389/fpsyg.2018.00539

Hayward, L. C. (2011). *Emotion and categorization: Do hoarders have difficulties with categorization, emotion, and categorizing when emotional?* State University of New York at Binghamton.

Heleniak, C., Jenness, J. L., Vander Stoep, A., McCauley, E., & McLaughlin, K. A. (2016). Childhood maltreatment exposure and disruptions in emotion regulation: A transdiagnostic pathway to adolescent internalizing and externalizing

psychopathology. *Cognitive Therapy and Research*, *40*(3), 394–415. https://doi.org/10.1007/s10608-015-9735-z

Joormann, J., & Stanton, C. H. (2016). Examining emotion regulation in depression: A review and future directions. *Behaviour Research and Therapy*, *86*, 35–49. https://doi.org/10.1016/j.brat.2016.07.007

Kang, H. (2013). The prevention and handling of the missing data. *Korean Journal of Anesthesiology*, *64*(5), 402. https://doi.org/10.4097/kjae.2013.64.5.402

Kehoe, E., & Egan, J. (2019). Interpersonal attachment insecurity and emotional attachment to possessions partly mediate the relationship between childhood trauma and hoarding symptoms in a non-clinical sample. *Journal of Obsessive-Compulsive and Related Disorders*, *21*, 37–45. https://doi.org/10.1016/j.jocrd.2018.12.001

Kim, B. R., Stifter, C. A., Philbrook, L. E., & Teti, D. M. (2014). Infant emotion regulation: Relations to bedtime emotional availability, attachment security, and temperament. *Infant Behavior and Development*, *37*(4), 480–490. https://doi.org/10.1016/j.infbeh.2014.06.006

Kring, A., Smith, D., & Neale, J. (1994). Individual differences in dispositional expressiveness: Development and validation of the Emotional Expressivity Scale. *Journal of Personality and Social Psychology*, *66*, 934–949. https://doi.org/10.1037//0022-3514.66.5.934

Kyrios, M. (2014). Psychological models of hoarding. *The Oxford Handbook of Hoarding and Acquiring*, 206–220.

Lavender, J. M., Tull, M. T., DiLillo, D., Messman-Moore, T., & Gratz, K. L. (2017). Development and validation of a state-based measure of emotion dysregulation: The State Difficulties in Emotion Regulation Scale (S-DERS). *Assessment*, *24*(2), 197–209. https://doi.org/10.1177/1073191115601218

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *Journal of Clinical Epidemiology*, *62*(10), e1–e34. https://doi.org/10.1016/j.jclinepi.2009.06.006

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, *33*(3), 335–343. https://doi.org/10.1016/0005-7967(94)00075-u

Mathes, B. M., Portero, A. K., Gibby, B. A., King, S. L., Raines, A. M., & Schmidt, N. B. (2018). Interpersonal trauma and hoarding: The mediating role of aggression. *Journal of Affective Disorders*, *227*, 512–516. https://doi.org/10.1016/j.jad.2017.11.062

McLaughlin, K. A., Mennin, D. S., & Farach, F. J. (2007). The contributory role of worry in emotion generation and dysregulation in generalized anxiety disorder. *Behaviour Research and Therapy*, *45*(8), 1735–1752. https://doi.org/10.1016/j.brat.2006.12.004

McMillan, S. G., Rees, C. S., & Pestell, C. (2013). An investigation of executive functioning, attention and working memory in compulsive hoarding. *Behavioural and Cognitive Psychotherapy*, *41*(5), 610. doi:10.1017/S1352465812000835

Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2005). Preliminary evidence for an emotion dysregulation model of generalized anxiety disorder. *Behaviour Research and Therapy*, *43*(10), 1281–1310. https://doi.org/10.1016/j.brat.2004.08.008

Nigg, J. T. (2017). Annual research review: On the relations among self-regulation, self-control, executive functioning, effortful control, cognitive control, impulsivity, risk-taking, and inhibition for developmental psychopathology. *Journal of Child Psychology and Psychiatry*, *58*(4), 361–383. https://doi.org/10.1111/jcpp.12675

Norberg, M. M., Beath, A. P., Kerin, F. J., Martyn, C., Baldwin, P., & Grisham, J. R. (2020). Trait versus task-induced emotional reactivity and distress intolerance in hoarding disorder: Transdiagnostic implications. *Behavior Therapy, 51*(1), 123–134. https://doi.org/10.1016/j.beth.2019.05.010

Nordsletten, A. E., de la Cruz, L. F., Pertusa, A., Reichenberg, A., Hatch, S. L., & Mataix-Cols, D. (2013). The Structured Interview for Hoarding Disorder (SIHD): Development, usage and further validation. *Journal of Obsessive-Compulsive and Related Disorders*, *2*(3), 346–350. https://doi.org/10.1016/j.jocrd.2013.06.003

Nordsletten, A. E., Reichenberg, A., Hatch, S. L., de la Cruz, L. F., Pertusa, A., Hotopf, M., & Mataix-Cols, D. (2013). Epidemiology of hoarding disorder. *The British Journal of Psychiatry*, *203*(6), 445–452. https://doi.org/10.1192/bjp.bp.113.130195

Orgeta, V. (2009). Specificity of age differences in emotion regulation. *Aging and Mental Health*, *13*(6), 818–826. https://doi.org/10.1080/13607860902989661

Orr, D. M., Preston-Shoot, M., & Braye, S. (2019). Meaning in hoarding: Perspectives of people who hoard on clutter, culture and agency. *Anthropology & Medicine*, *26*(3), 263-279. https://doi.org/10.1080/13648470.2017.1391171

Osborne, T. L., Michonski, J., Sayrs, J., Welch, S. S., & Anderson, L. K. (2017). Factor structure of the Difficulties in Emotion Regulation Scale (DERS) in adult outpatients receiving dialectical behavior therapy (DBT). *Journal of Psychopathology and Behavioral Assessment*, *39*(2), 355–371. https://doi.org/10.1007/s10862-017-9586-x

Phung, P. J., Moulding, R., Taylor, J. K., & Nedeljkovic, M. (2015). Emotional regulation, attachment to possessions and hoarding symptoms. *Scandinavian Journal of Psychology*, *56*(5), 573–581. https://doi.org/10.1111/sjop.12239

Postlethwaite, A., Kellett, S., & Mataix-Cols, D. (2019). Prevalence of hoarding disorder: A systematic review and meta-analysis. *Journal of Affective Disorders*, *256*, 309–316. https://doi.org/10.1016/j.jad.2019.06.004

Raines, A. M., Boffa, J. W., Allan, N. P., Short, N. A., & Schmidt, N. B. (2015). Hoarding and eating pathology: The mediating role of emotion regulation. *Comprehensive Psychiatry*, *57*, 29–35. https://doi.org/10.1016/j.comppsych.2014.11.005

Raines, A. M., Chavarria, J., Allan, N. P., Short, N. A., & Schmidt, N. B. (2017). Hoarding behaviors and alcohol use: the mediating role of emotion dysregulation. *Substance Use & Misuse*, *52*(13), 1684–1691. https://doi.org/10.1080/10826084.2017.1305414

Roemer, L., Lee, J. K., Salters-Pedneault, K., Erisman, S. M., Orsillo, S. M., & Mennin, D. S. (2009). Mindfulness and emotion regulation difficulties in generalized anxiety disorder: Preliminary evidence for independent and overlapping contributions. *Behavior Therapy*, *40*(2), 142–154. https://doi.org/10.1016/j.beth.2008.04.001

Rosario-Campos, M. C., Miguel, E. C., Quatrano, S., Chacon, P., Ferrao, Y., Findley, D., & Tolin, D. (2006). The Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS): an instrument for assessing obsessive–compulsive symptom dimensions. *Molecular Psychiatry*, *11*(5), 495–504. ttps://doi.org/10.1038/sj.mp.4001798

Shaw, A. M., Llabre, M. M., & Timpano, K. R. (2015). Affect intolerance and hoarding symptoms: A structural equation modeling approach. *International Journal of Cognitive Therapy*, *8*(3), 222–238. https://doi.org/10.1521/ijct_2015_8_05

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., & Dunbar, G. C. (1998). The Mini-International Neuropsychiatric Interview (MINI): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *The Journal of Clinical Psychiatry*.

Sloan, E., Hall, K., Moulding, R., Bryce, S., Mildred, H., & Staiger, P. K. (2017). Emotion regulation as a transdiagnostic treatment construct across anxiety, depression, substance, eating and borderline personality disorders: A systematic review. *Clinical Psychology Review*, *57*, 141–163. https://doi.org/10.1016/j.cpr.2017.09.002

Steketee, G., & Frost, R. (2003). Compulsive hoarding: Current status of the research. *Clinical Psychology Review*, *23*(7), 905–927. https://doi.org/10.1016/j.cpr.2003.08.002

Steketee, G., & Frost, R. (2010). *Stuff: Compulsive hoarding and the meaning of things*. Houghton Mifflin Harcourt.

Steketee, G., & Frost, R. O. (2013). *Treatment for hoarding disorder: Therapist guide*. Oxford University Press.

Steketee, G., Frost, R. O., & Kyrios, M. (2003). Cognitive aspects of compulsive hoarding. *Cognitive Therapy and Research*, *27*(4), 463–479. https://doi.org/10.1023/A:1025428631552

Taylor, J. (2017). *The role of emotion regulation in compulsive hoarding*. Swinburne University of Technology.

Timpano, K. R., Buckner, J. D., Richey, J. A., Murphy, D. L., & Schmidt, N. B. (2009). Exploration of anxiety sensitivity and distress tolerance as vulnerability factors for hoarding behaviors. *Depression and Anxiety*, *26*(4), 343–353. https://doi.org/10.1002/da.20469

Timpano, K. R., Shaw, A. M., Cougle, J. R., & Fitch, K. E. (2014). A multifaceted assessment of emotional tolerance and intensity in hoarding. *Behavior Therapy*, *45*(5), 690–699. https://doi.org/10.1016/j.beth.2014.04.002

Tolin, D. F., Frost, R. O., & Steketee, G. (2010). A brief interview for assessing compulsive hoarding: The Hoarding Rating Scale-Interview. *Psychiatry Research*, *178*(1), 147–152.

Tolin, D. F., Frost, R. O., Steketee, G., & Muroff, J. (2015). Cognitive behavioral therapy for hoarding disorder: A meta-analysis. *Depression and Anxiety*, *32*(3), 158–166. https://doi.org/10.1002/da.22327

Tolin, D. F., Gilliam, C., Wootton, B. M., Bowe, W., Bragdon, L. B., Davis, E., & Hallion, L. S. (2018). Psychometric properties of a structured diagnostic interview for DSM-5 anxiety, mood, and obsessive-compulsive and related disorders. *Assessment*, *25*(1), 3–13. https://doi.org/10.1177/1073191116638410

Tolin, D. F., Levy, H. C., Wootton, B. M., Hallion, L. S., & Stevens, M. C. (2018). Hoarding disorder and difficulties in emotion regulation. *Journal of Obsessive-Compulsive and Related Disorders*, *16*, 98–103. https://doi.org/10.1016/j.jocrd.2018.01.006

Tull, M. T., Bardeen, J. R., DiLillo, D., Messman-Moore, T., & Gratz, K. L. (2015). A prospective investigation of emotion dysregulation as a moderator of the relation between posttraumatic stress symptoms and substance use severity. *Journal of Anxiety Disorders*, *29*, 52–60. https://doi.org/10.1016/j.janxdis.2014.11.003

Victor, S. E., & Klonsky, E. D. (2016). Validation of a brief version of the difficulties in emotion regulation scale (DERS-18) in five samples. *Journal of Psychopathology and Behavioral Assessment*, *38*(4), 582–589. https://doi.org/10.1007/s10862-016-9547-9

Wager, E., & Williams, P. (2013). "Hardly worth the effort"? Medical journals' policies and their editors' and publishers' views on trial registration and publication bias: Quantitative and qualitative study. *British Medical Journal*, *347*, f5248. https://doi.org/10.1136/bmj.f5248

Wass, S. (2020). *The origins of effortful control: How early development within arousal/regulatory systems influences cognitive and affective control*. [Unpublished Manuscript]. https://doi.org/10.31234/osf.io/n6fjm

Williams, A. D., & Grisham, J. R. (2012). Impulsivity, emotion regulation, and mindful attentional focus in compulsive buying. *Cognitive Therapy and Research*, *36*(5), 451–457. https://doi.org/10.1007/s10608-011-9384-9

Woody, S. R., Lenkic, P., Bratiotis, C., Kysow, K., Luu, M., Edsell-Vetter, J., & Tolin, D. F. (2020). How well do hoarding research samples represent cases that rise to community attention? *Behaviour Research and Therapy*, *126*, 103555. https://doi.org/10.1016/j.brat.2020.103555

Worden, B., Levy, H. C., Das, A., Katz, B. W., Stevens, M., & Tolin, D. F. (2019). Perceived emotion regulation and emotional distress tolerance in patients with hoarding disorder. *Journal of Obsessive-Compulsive and Related Disorders*, *22*, 100441. https://doi.org/10.1016/j.jocrd.2019.100441

Zimmermann, P., & Iwanski, A. (2014). Emotion regulation from early adolescence to emerging adulthood and middle adulthood: Age differences, gender differences, and emotion-specific developmental variations. *International Journal of Behavioral Development*, *38*(2), 182–194. https://doi.org/10.1177/0165025413515405