

RESEARCH ARTICLE

Loss of control as a transdiagnostic feature in obesity-related eating behaviours: A systematic review

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Abstract

Objective: Emerging evidence suggests that loss of control (LOC) may present as a common feature across disordered eating behaviours. However, there has been limited research on the transdiagnostic nature of LOC in this area. The primary aim of this study was to systematically review disordered eating behaviours and measures of LOC in clinical and non-clinical populations.

Method: Electronic searches of the relevant databases were conducted. Selected articles were screened for eligibility and assessed for methodological quality.

Results: Thirty-four studies met inclusion criteria. Findings demonstrated that LOC was associated with disordered eating behaviours across bariatric populations, eating disorder populations, and community populations. Specifically, LOC was associated with binge eating (subjective and objective episodes), grazing, night eating, and emotional or stress eating. Findings also revealed that LOC was inconsistently operationalised across studies, with varied approaches to measuring the construct.

Abbreviations: Add Health, Longitudinal Study of Adolescent to Adult Health; APA, American Psychiatric Association; AUDIT, Alcohol Use Disorders Identification Test; Bar-BED, Bariatric binge eating disorder; BDI, Beck Depression Inventory; BDI-II, Beck Depression Inventory, 2nd Edition; BE, binge eating; BED, binge eating disorder; BES, Binge Eating Scale; BMI, body mass index; BSI-18, Brief Symptom Inventory-18; BULIT-R, The Bulimia Test-Revised; CRAFFT, Crafft Screening Test; DASS-21, Depression, Anxiety, Stress Scales-21; DE, disordered eating; DEB, disordered eating behaviour; DEBQ, Dutch Eating Behaviour Questionnaire; DOT, Door Opening Task; DSM-5, Diagnostic and Statistical Manual of Mental Disorders, 5th Edition; DSM-IV TR, Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision; ED, eating disorder; ED-15, Eating Disorders-15; EDE, Eating Disorder Examination; EDE-BSV, Eating Disorder Examination-Bariatric Version; EDE-Q, Eating Disorder Examination-Questionnaire; EDDS, Eating Disorder Diagnosis Scale; EDI-3, Eating Disorders Inventory-3; EEE, Eating and Exercise Examination; ELOCS, Eating Loss of Control Scale; EOQ, Yale Emotional Overeating Questionnaire; ISEL, Interpersonal Support Evaluation List; IWQOL-Lite, Impact of Weight on Quality of Life-Lite; LOC, loss of control; LOCES, Loss of Control Over Eating Scale; LOCES-B, Loss of Control Over Eating Scale - Brief; MAEDS, Multifactorial Assessment of Eating Disorders Symptoms; MINI, Mini-International Psychiatric Interview; MMPI-2-RF, Minnesota Multiphasic Personality Inventory, 2nd Edition, Restructured Form; NEQ, Night Eating Questionnaire; N.R, not reported; OBE, objective binge eating; PANAS, Positive and Negative Affect Scale; PFS, Power of Food Scale; PHQ-9, Patient Health Questionnaire-9; PRISMA, preferred reporting items for systematic reviews and meta-analyses; SBE, subjective binge eating; SCID, Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders; SDS, Sheehan Disability Scale; SDS-17, Social Desirability Scale-17; SIAB, Structured Interview for Eating Disorders; SF-12, 12-item Short Form Health Survey; SF-36, 36-item Short Form Health Survey; SSABS, Semistarvation-Associated Behaviours Scale; SST, Stop Signal Task; TFEQ, Three Factor Eating Questionnaire; TFEQ-R18, Three Factor Eating Questionnaire-Revised 18; TFEQ-R21, Three Factor Eating Questionnaire-Revised 21; QEWP, Questionnaire on Eating and Weight Patterns; YFAS 2.0, Yale Food Addiction Scale Version 2.0; YSQ-S2, Young Schema Questionnaire – Short Form.

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Conclusion: Overall, the findings from this review provide support for LOC as a transdiagnostic feature of disordered eating behaviours. Future studies should utilise robust multi-method assessments to measure the severity of LOC, which may provide greater insight into how LOC manifests across different eating disorder presentations.

KEYWORDS

binge eating, disordered eating, eating disorders, loss of control, obesity

Key points

- Loss of control (LOC) was found to be a transdiagnostic feature across a range of disordered eating behaviours.
- LOC was associated with increased psychopathology, poorer quality of life, and poorer prognosis for bariatric patients.
- LOC in disordered eating was present in both clinical and non-clinical populations.
- Inconsistencies were found in the measurement of LOC across studies.

1 | INTRODUCTION

Obesity, defined as the accumulation of excess body fat and a body mass index (BMI) of 30 or above, is a risk factor for serious medical conditions and may lead to compromised quality of life and psychological comorbidities (WHO, 2020). Disordered eating behaviours (e.g., binge eating, emotional eating) have been shown to complicate weight management and may contribute to the development of obesity (Goldschmidt, 2017; Grilo et al., 2011). Thus, an increased understanding of the underlying psychological mechanisms that contribute to poor eating behaviours is helpful to inform the assessment and treatment of eating disorders (EDs) and obesity.

Independent of the amount of energy intake, a sense of loss of control (LOC) in eating has been associated with weight gain, poor weight loss outcomes, risk of developing EDs, and significant emotional distress (Devlin et al., 2016; Goldschmidt et al., 2018). LOC in eating has been defined as the subjective and objective experience of an inability to self-regulate eating behaviour, irrespective of the food intake, including the feeling that one cannot stop eating or control how much one is eating (Colles et al., 2008b; Conceição et al., 2014). Research suggests that LOC in eating is associated with psychological distress, quality of life impairments, and poor outcomes in treatment programs for disordered eating, regardless of the amount consumed (Latner et al., 2007, 2014; Manasse et al., 2014). The prevalence of LOC in disordered eating behaviours and EDs has been endorsed by individuals across clinical and non-clinical samples, including post-surgery bariatric patients

(Ivezaj et al., 2017, 2018). For example, LOC has been defined as a characteristic feature of binge eating disorder (BED) in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association (APA), 2013). Studies have shown that for people with BED, the sense of LOC is associated with increased negative affect and psychological distress (Colles et al., 2008b). Although overeating and LOC are both required in the diagnostic criteria of BED, evidence has suggested that LOC constitutes a clinically significant disturbance, independent of overeating (Latner et al., 2014). For example, in both community and clinical samples, the experience of eating-related LOC is a better predictor of an ED and comorbid psychopathology, distress, and impairment in psychosocial functioning than the amount of food consumed (Latner et al., 2014). LOC and overeating are thus considered independent constructs, as LOC eating is not determined by the amount of food that is consumed. Instead, LOC incorporates difficulty stopping eating, preventing oneself from eating, or controlling the amount consumed (American Psychiatric Association, 2013; Byrne et al., 2019; Wiedemann, Ivezaj, & Grilo, 2018). As an independent construct, LOC has been difficult to operationalise and reliably measure across studies due to its complex presentation and variability (Goldschmidt et al., 2015). To date, studies have either assessed the prevalence of LOC eating or determined a frequency score by combining episodes of objective and subjective binge eating (Goldschmidt et al., 2015; Smith et al., 2019).

Interestingly, research has found that the combination of binge eating a large amount of food with LOC

predicted the presence of depressive symptomology and increased the likelihood of being overweight in adults, while episodes of overeating without a feeling of LOC did not predict the same (Colles et al., 2008b; Goldschmidt et al., 2016; Hart et al., 2020). This suggests that the LOC associated with a binge eating episode may contribute to psychological distress, rather than the presence of the episode itself or the amount consumed. Studies have also found associations with global and specific measures of disordered eating and LOC (Blomquist et al., 2014; Bodell et al., 2018; Cleator et al., 2012; Conceicao et al., 2017; Latner et al., 2014). Further, LOC has been associated with poor quality of life, problematic weight control behaviours, low self-esteem, disinhibition while eating, emotion dysregulation, depressive symptoms, and general distress in people with EDs or obesity as well as subclinical and community populations (Colles et al., 2008a; Goldschmidt et al., 2015; Latner et al., 2007). In addition, LOC has been evidenced to independently contribute to negative affect and is a better predictor of distress experienced before and after an overeating episode than the amount of food consumed (Goldschmidt et al., 2012; Kelly et al., 2018). Thus, when individuals engage in disordered eating behaviours, it is the sense of LOC with eating that is more strongly related to psychopathology than the amount consumed.

Recent evidence has also suggested that disordered eating behaviours are associated with executive function deficits (Yang et al., 2018) regardless of differences in age, sex, level of education, diet, or level of obesity (Edwards et al., 2018). Executive functions are processes necessary for the cognitive control of behaviour and play an important role in mediating self-control, self-regulation, and decision-making (Danner et al., 2012). The comorbidity between obesity, LOC, and disordered eating may reflect the potential influence of executive deficits (Byrne et al., 2019). Executive functions may influence one's ability to control or regulate their dietary choices and have been found to moderate the relationship between one's attitudes or intentions towards eating and their observed behaviour (Dohle et al., 2017). Additionally, a sense of LOC with eating appears to be more resistant to bariatric surgery, with experiences of LOC eating remaining or developing post-surgery (Hildebrandt & Latner, 2006). Taken together, these associations suggest LOC as an underlying transdiagnostic component of disordered eating. To date, however, no study has systematically presented or integrated findings across ED studies to allow LOC to be fully investigated as a transdiagnostic feature.

The present review examined research over the past seven years, since the inclusion of BED as a formal diagnosis in the DSM-5, and systematically synthesised findings on disordered eating and measures of LOC. The

primary aim of this study was to review disordered eating behaviours and measures of LOC in adult clinical and non-clinical populations to identify whether LOC exists as a transdiagnostic feature across disordered eating. It was hypothesised that LOC would present as a transdiagnostic feature across studies of disordered eating. Further, it was predicted that LOC would be supported as a disordered eating feature across both clinical and community populations.

2 | METHOD

2.1 | Protocol and registration

This systematic review was conducted in accordance with the preferred reporting items for systematic reviews (PRISMA) procedures (Liberati et al., 2009) and was registered with the PROSPERO international prospective register of systematic reviews (CRD42020189513; available from: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=189513).

2.2 | Search strategy

A systematic search of the electronic databases ProQuest, PubMed, and PsycINFO was conducted. This search included studies published from May 2013 to August 2020. In order to focus the present study on current conceptualisations of LOC and EDs, studies published prior to 2013 were excluded from this review because the APA published the DSM-5 in that year and for the first time included BED as a formal diagnosis, influencing the perception and research of EDs (Call et al., 2013). This focussed search enabled the ability to stratify outcomes according to disordered eating behaviour and to conduct research utilising the current conceptualisation of BED. Adopting an updated conceptualisation of BED is central to understanding the relationship between BED and LOC, especially among individuals with obesity. The search was conducted using keywords (see Table 1). Search limiters included English language, human research, peer-reviewed journal articles published between 2013 and 2020, and adult participants. Additionally, a manual search of the reference sections of eligible studies was performed.

2.3 | Study selection

The study selection process was independently completed by three authors (J.C., D.S., and J.R.). Identified studies

TABLE 1 Search strategy

Keywords
“Loss of control”
AND
“Eating disorders” OR “disordered eating” OR “impulsive eating” OR “emotional eating” OR “stress eating” OR “comfort eating” OR “night eating” OR “sweet eating” OR “grazing” OR “binge eating”
NOT
“Anorexia” or “bulimia”

Abbreviations: BDI, Beck Depression Inventory; BULIT-R, The Bulimia Test-Revised; DE, Disordered eating; DEB, Disordered eating behaviours; ELOCS, eating loss of control scale; ISEL, Interpersonal Support Evaluation List; IWQOL-Lite, Impact of Weight on Quality of Life-Lite; OBE, objective binge eating; SBE, subjective binge eating; SIAB, structured interview for eating disorders.

were examined for duplicates, which were excluded. The titles and abstracts of the remaining studies were examined, and non-relevant studies were removed. Studies that did not measure obesity-related disordered eating behaviours were excluded. No restrictions were placed on the sex of participants or study type (e.g., observation, intervention). Studies were also excluded if the predominant focus was not on disordered eating. Table 2 presents the inclusion criteria.

2.4 | Quality assessment

The retrieved articles were independently assessed by three authors (J.C., D.S., and J.R.) using a modified version of the Quality Index from Downs & Black (Downs & Black, 1998) that can be used for observational and cross-sectional studies (Ferro & Speechley, 2009). The adapted tool excludes 12 original items addressing characteristics of intervention studies such as blinding and randomisation. The revised version consisted of 15 items, which are each scored as 0 (*no/unable to determine*) or 1 (*yes*). Scores range from 0 to 15, with higher scores indicating greater methodological quality. Scores above 10 were considered to represent studies of higher quality. This categorisation of scores represents a similar approach to a recent systematic review of grazing behaviour (Heriseanu et al., 2017).

2.5 | Data analysis strategy

Studies that met the inclusion criteria were individually coded by three authors (J.C., D.S., and J.R.) to evaluate the methodological quality of the study and assess its

TABLE 2 List of inclusion criteria

Criteria
1. LOC was measured
2. A definition of LOC was provided or could be inferred from the assessment instrument
3. Measurement of disordered eating behaviours or correlates (e.g., eating disorder pathology) were reported
4. Participants were over 18 years of age and under 65 years of age
5. Publication in a peer-reviewed journal or accepted for publication
6. Published after the introduction of the DSM-5
7. Available in English

Abbreviations: DSM-5, diagnostic and statistical manual of mental disorders; fifth edition, LOC; loss of control.

relevance to the research question. Data from each study was extracted by one author (J.C.) and included: authors, journal name, date of publication, sample size, demographics (mean age, sex breakdown, mean BMI), psychiatric measures, disordered eating measures, and overall findings. To assist with the analysis and interpretation of results, each study was organised according to the predominant disordered eating feature or population investigated (e.g., bariatric, BED, grazing). Studies that did not fit in one category were assigned to the most appropriate category (e.g., if they investigated several disordered eating behaviours).

3 | RESULTS

3.1 | Study selection

The study selection process is presented in Figure 1. In total, 1029 articles were reviewed. Of these, 842 were excluded according to title and abstract, and an additional 154 studies were excluded following examination of the full text. Overall, 34 studies (comprising 32 data sets) were included in this review.

3.2 | Description of studies

The 34 studies that met inclusion criteria were indicative of the research conducted on the topic of LOC and disordered eating in adults from 2013 to 2020. The studies were mostly observational cohort studies. On average, samples were composed predominantly of females and the mean age was 35.8 ($SD = 10.3$). All studies reported the prevalence of LOC in their study sample or subsample. LOC outcomes were assessed through five different

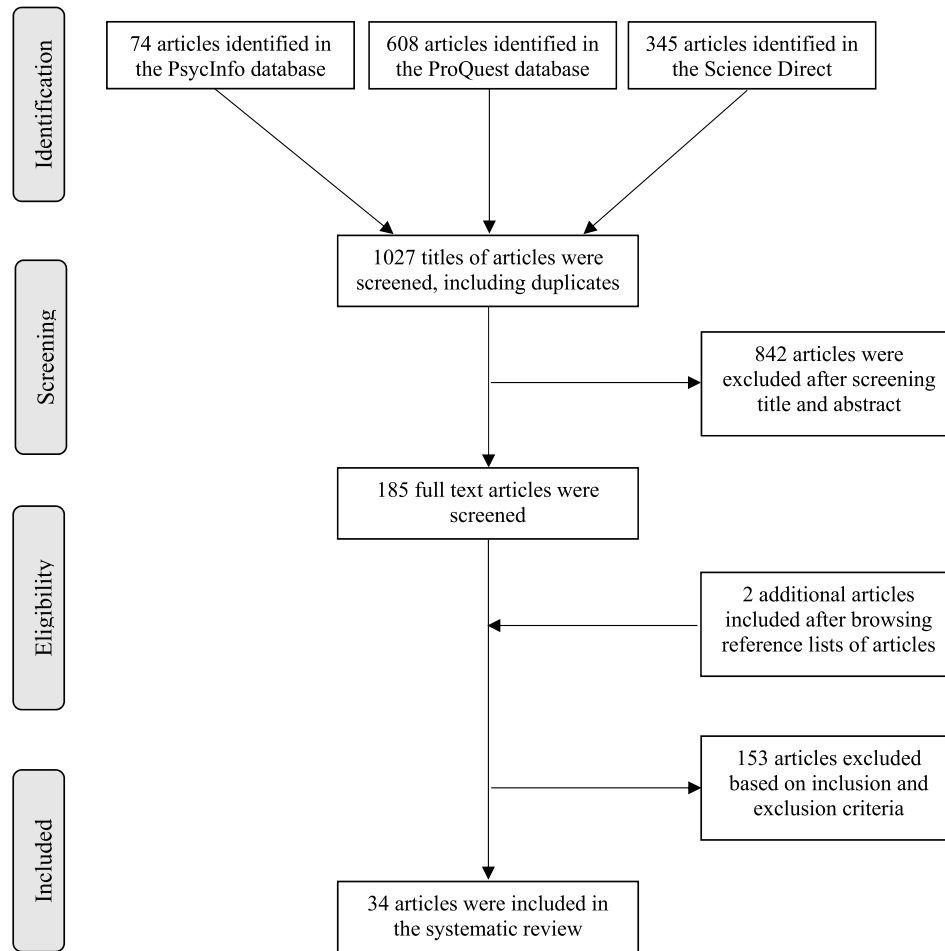


FIGURE 1 Flow chart of the literature search and documentation of the screening, inclusion, and exclusion processes

assessment measures. Table 3 presents key study characteristics and results across the included studies.

3.3 | Quality assessment

According to the quality assessment tool for observational and cross-sectional studies, 30 studies were rated above 10 (85.71%). Studies with a score above 10 were considered of good quality. The mean total score on the Quality Index was 11.77/15.00 ($SD = 1.83$), with scores ranging from 7 to 14. The mean subscale scores were 6.26/7.00 ($SD = 1.04$; range: 4–7) for quality of reporting, 2.63/3.00 ($SD = 0.60$; range: 1–3) for external validity, and 2.46/4.00 ($SD = 0.70$; range: 0–3) for internal validity. Most studies clearly outlined aims, hypotheses, and main findings, and applied appropriate statistical methods. Ten studies did not demonstrate that recruited participants were representative of the population from which they came (i.e., by using a random or consecutive sample) and 14 studies did not consider the distribution of confounding factors in their sample.

3.4 | Assessing LOC

Four studies measured LOC as an independent construct using a validated and reliable measure (e.g., LOCES, ELOCS; Bodell et al., 2018; Hopwood et al., 2018; Latner et al., 2014; Stefano et al., 2016). Twenty studies assessed the presence/absence of LOC using a general measure of disordered eating (e.g., Eating Disorder Examination, Three Factor Eating Questionnaire; Berg et al., 2014; Coker et al., 2015; Conceicao et al., 2014; Constant et al., 2018; Devlin et al., 2016, 2018; Dingemans et al., 2015; Engstrom et al., 2015; Ivezaj et al., 2017, 2018, 2019; Kelly et al., 2018; Legenbauer et al., 2018; Mack et al., 2016; Mason et al., 2019; Preuss et al., 2019; Royal et al., 2015; Stevenson et al., 2018; Wiedemann, Ivezaj, & Barnes, 2018; Wiedemann, Ivezaj, & Grilo, 2018). Six studies measured LOC as a function of grazing behaviour (e.g., Grazing Questionnaire, Repetitive Eating-Questionnaire; Aloï et al., 2017; Conceicao et al., 2017, 2018; Heriseanu et al., 2019; Lane & Szabó, 2013; Reas et al., 2019) and the remaining five studies assessed LOC using adapted questions and Likert scales (Berg et al., 2015; Carey et al., 2017;

TABLE 3 Study characteristics of the included studies

Study	Sample	Female %	Age M (SD)	BMI M (SD)	Psychiatric measure	Disordered eating measure	Findings
LOC in bariatric surgery patients							
Conceição et al., 2014	N = 339	88.0	41.7 (10.8)	44.2 (5.6)	BDI	EDE-BSV; EDE-Q; body shape questionnaire (Cooper et al., 1986)	LOC was associated with greater psychological impairments and poorer weight outcomes.
Conceicao et al., 2017	Study A: N = 1223 Study B: Pre-surgery: n = 154 Post-surgery: n = 84	70.2	33.7 (15.0)	23.0 (3.4)	DASS-21; UPPS impulsive behaviour scale (Whiteside et al., 2005)	Repetitive eating questionnaire (Conceicao et al., 2017); EDE-Q; ED-15; TFEQ	Correlations were found between grazing with LOC ('compulsive grazing') and eating disorder psychopathology
Conceicao et al., 2018	N = 294	84.0	41.0 (11.4)	43.0 (5.5) 30.4 (6.7)	DASS-21; UPPS impulsive behaviour scale – Negative Urgency subscale (Whiteside et al., 2005)	EDE; Repetitive eating questionnaire (Conceicao et al., 2017); ED-15; TFEQ-R21 Adapted questions on Likert scale	LOC was found to be a full mediator between DEB and psychopathology
Devlin et al., 2016	Pre-surgery group: n = 163 Post-surgery group: n = 131 N = 183	83.1	46.0 (n.r.)	29.8 (6.0) 45.1 ^a		Structured interview EDE-BSV	Prevalence of LOC declined from baseline to follow-up. LOC remained in a minority of the sample.
Devlin et al., 2018	As above	83.1	46.0 (n.r.)	45.2 (n.r.)	SF-36	Structured interview EDE-BSV	Some patients developed LOC post-surgery
Engstrom et al., 2015	N = 49 Group 1: n = 29 Group 2: n = 20	n.r.	36 (n.r.)	54.7 (3.4) 55.6 (3.6)		TFEQ-R21	Poor control over eating was associated with emotional eating,

TABLE 3 (Continued)

Study	Sample	Female %	Age M (SD)	BMI M (SD)	Psychiatric measure	Disordered eating measure	Findings
Ivezaj et al., 2017	N = 71	84.5	47.3 (10.1)	37.9 (8.2)		EDE-BSV	psychopathology and reduced cognitive restraint at follow-up Majority endorsed LOC following surgery. 49.3% met criteria for Bar-BED
Ivezaj et al., 2018	N = 431	78.7	45.7 (11.1)	37.2 (6.5)	BDI-II	EDE; EDE-BSV	LOC at follow-up was associated with psychopathology
Ivezaj et al., 2019	N = 145	n.r.	45.4 (11.2)	37.7 (7.3)	BDI-II; SDS; MINI	EDE-BSV	Overvaluation of weight was associated with greater LOC and DE, and a history of BED
Mack et al., 2016	N = 75	64.0	45.2 (11.6)	48.7 (8.4)	PHQ-9	EDE; TFEQ; SIAB	11% of respondents endorsed LOC at follow up.
Mitchell et al., 2015	N = 2266	78.6	46 ^a	45.9 ^a	AUDIT; BDI; SF-36; ISEL; IWQOL-Lite	LABS-2 behaviour form	LOC was reported by 43.4%, night eating syndrome by 17.7%; 15.6% met BED criteria (Continues)

TABLE 3 (Continued)

Study	Sample	Female %	Age M (SD)	BMI M (SD)	Psychiatric measure	Disordered eating measure	Findings
LOC in BED							
Dingemans et al., 2012	N = 75	100	35.6 (n.r.)	34.3 (n.r.)	BDI-II; Trailmaking test (Tester)	EDE	LOC associated with poor set-shifting
Hopwood et al., 2018	BED: n = 226 Non-BED: n = 476	72.1 72.5	47.3 (10.9) n.r.	38.2 (5.8) n.r.		ELOCS	ELOCS was found to be a reliable and valid measure of LOC across clinical and non-clinical participants
Legenbauer et al., 2018	N = 90 Bulimia nervosa: n = 29 BED: n = 31 No ED: n = 30	100	28.1 (7.9)	24.8 (6.6)	YSQ-S2; BDI-II	EDE-Q	BE was positively predicted by thoughts of LOC
Preuss et al., 2019	N = 101 BED sample: n = 24 Non-BED sample: n = 47 Control group: n = 30	86.1	37.3 (n.r.)	25.5 (n.r.)	DOT; SST; UPSS impulsive behaviour scale (Whiteside et al., 2005); food Stroop task (Pinnow & Kirkcaldy, 2012)	EDE-Q; TFEQ	Late-stage interruptive inhibition might result in LOC especially in BED when executive resources are depleted
Goodpaster et al., 2016	N = 288	77.4	45.9 (12.6)	48.1 (9.0)	MMPI-2-RF	BES; structured interview	LOC was associated with grazing, anxiety and BED

TABLE 3 (Continued)

Study	Sample	Female %	Age M (SD)	BMI M (SD)	Psychiatric measure	Disordered eating measure	Findings
LOC in binge eating							
Coker et al., 2015	N = 197	100	39.8 (11.2)	43.0 (6.7)		EEE	Positive association between BE and LOC
Kelly et al., 2018	N = 1114	0.0	24.2 (3.6)	25.4 (6.2)		EDE; revised male body image attitudes scale (Ryan et al., 2011)	Those engaging in OBE and SBE may be at the highest risk of weight-related medical comorbidity
Mason & Heron, 2016	N = 15,197	n.r.	n.r.	n.r.		Add health	LOC was associated with BE and psychopathology
Mason et al., 2019	N = 439	100	n.r.	30.9 (4.0)	BSI-18; perceived stress scale (Cohen et al., 1983)	BES; TFEQ-R18	BE, LOC, and emotional eating negatively associated with dietary intervention
LOC and general disordered eating pathology							
Bodell et al., 2018	Clinical sample: n = 106 Control group: n = 321	89.6 74.6	28.0 19.6	n.r. n.r.		ELOC; LOCES	Both measures were associated with BE and general DE.
Latner et al., 2014	Study 1: Expert group: n = 34 ED group: n = 22 Study 2: n = 476	75.8 100 70.0	n.r. 20.4 (n.r.)	n.r. 22.8 (n.r.)		LOCES; EDE; BES; BULIT/R; EDI; DEBQ; TFEQ; MAEDS; QEWPP; PFS; YFAS 2.0	LOCES was significantly correlated with DE, general distress, functional impairment, and general self-control.
Stefano et al., 2016	N = 261	75.9	21.1 (3.8)	23.7 (3.8)		EDE-Q; LOCES	LOC was associated with ED and was a

(Continues)

TABLE 3 (Continued)

Study	Sample	Female %	Age M (SD)	BMI M (SD)	Psychiatric measure	Disordered eating measure	Findings
Royal et al., 2015	N = 226	79.0	43.8 (10.9)	49.8 (8.3)	AUDIT; SF-36; PHQ-9	NEQ; EDE-Q	LOC was associated with increased psychological burden in bariatric candidates. LOC was associated with BE and night eating
LOC and grazing							
Aloi et al., 2017	N = 293	72.0	22.2 (3.2)	22.6 (3.2)	BDI-II, State-trait anxiety inventory (Spielberger et al., 1983)	BES; EDE-Q; NEQ	Confirmed factor of grazing questionnaire. (Lane & Szabó, 2013) scores related to other disordered eating
Heriseanu et al., 2019	N = 227	75.3	25.0 (9.9)	23.2 (4.9)	DASS-21; self-report habit index (Verplanken & Orbell, 2003); SDS-17; SF-12	Short inventory of grazing (Heriseanu et al., 2019); grazing questionnaire; EDE-Q; BES; DEBQ; LOCES-B	LOC grazing was associated with higher BMI, increased psychological distress and other disordered eating
Lane & Szabó, 2013	N = 248	73.0	20.0 (4.3)	21.7 (3.2)	DASS-21	Grazing questionnaire; BES; NEQ; EDI3; EDDS; SSABS; DEBQ-R	Grazing was positively associated with disordered eating
Reas et al., 2019	N = 190	78.0	22.6 (4.2)	22.4 (2.9)	EDDS; YFAS 2.0; Repetitive eating questionnaire (Conceicao et al., 2017)	Factor structure confirmed for grazing with LOC ('compulsive grazing')	

TABLE 3 (Continued)

Study	Sample	Female %	Age M (SD)	BMI M (SD)	Psychiatric measure	Disordered eating measure	Findings
LOC and emotional/stress eating							
Berg et al., 2014	N = 50	84.0	43.0 (11.9)	40.3 (8.5)	SCID-I/P; PANAS	EDE	LOC not related to daily affect but to episodes of negative affect (especially guilt)
Berg et al., 2015	N = 50	84.0	43.0 (11.9)	40.3 (8.5)	SCID-I/P; PANAS; BDI-II	Structured questions on Likert scale	LOC-only episodes not precipitated or maintained by global negative affect
Carey et al., 2017	N = 13	0.0	32.1 (12.7)	34.0 (3.6)		Semi-structured interview	Majority endorsed 'mindless eating'
Constant et al., 2018	N = 335	100	20.1 (n.r.)	21.0 (1.9)	CRAFT; AUDIT	EOQ; TFEQ-R18; SCOFF	Stress eating episodes were associated with other disordered eating behaviours and LOC
Stevenson et al., 2018	N = 45	73.0	23.7 (6.3)	30.9 (10.2)	SCID-I/P; PANAS	EDE-Q	Negative mood was a precursor for LOC eating
Wiedemann, Ivezaj, & Barnes, 2018	N = 131 n = 35 BED patients	80.0	47.6 (10.5)	35.3 (6.5)		EOQ; EDE	Emotional eating was associated with LOC, and greater for those with BED

(Continues)

TABLE 3 (Continued)

Study	Sample	Female %	Age M (SD)	BMI M (SD)	Psychiatric measure	Disordered eating measure	Findings
Wiedemann, Ivezaj, & Grilo, 2018	N = 134	85.0	45.5 (10.8)	37.7 (7.1)	BDI-II	EDE-BSV; EOQ	Emotional eating and LOC eating negatively correlated with post-surgical weight loss

Abbreviations: Add Health, longitudinal study of adolescent to adult health (Harris et al., 2006); AUDIT; alcohol use disorders identification test (Babor et al., 1992); BE, binge eating; BMI, body mass index; BES, binge eating scale (Gormally et al., 1982); BDI, Beck Depression Inventory; BDI-II; Beck Depression Inventory, 2nd Edition (Beck et al., 1996); BSI-18, brief symptom inventory; BULLIT-R, The Bulimia Test-Revised (Derogatis, 2001); CRAFFT, craft screening test (Knight et al., 2002); DASS-21, depression; anxiety, and stress scales (Lovibond Shi, 1995); DEBQ, Dutch eating behaviour questionnaire; DE, Disordered eating (Domoff and Wade, 2015); DOT, door opening task (Matthys et al., 1998); ED-15, eating disorders-15 (Tatham et al., 2015); EDE/EDE-Q/EDE-BSV, eating disorder examination/-bariatric surgery version (Fairburn & O'Connor, 2008); EDDS, eating disorder diagnosis scale (Stice et al., 2000); EDI-3, eating disorders inventory-3 (Garner, 2004); EEE, eating and exercise examination (Abraham & Lovell, 1999); ELOCS, eating loss of control scale; EOQ, Yale emotional overeating questionnaire (Masheb & Grilo, 2006); ISEL, Interpersonal Support Evaluation List; IWQOL-Lite, Impact of Weight on Quality of Life-Lite; LABS-2 behaviour form, available online at www.niddkdlabs.org; LOCES-B, loss of control over eating scale-brief (Latner et al., 2014); MAEDS, multifactorial assessment of eating disorders symptoms (Anderson et al., 1999); MINI, mini-international psychiatric interview (Sheehan et al., 1998); MMPI-2-RF, Minnesota multiphasic personality inventory-2-restructured form (Ben-Porath & Tellegen, 2008); NEQ, night eating questionnaire (Allison et al., 2008); n. r., not reported; OBE, objective binge eating; PANAS, positive and negative affect scale (Watson et al., 1988); SBE, subjective binge eating; SIAB, structured interview for eating disorders; TFEQ; TFEQ-R18, TFEQ-R21; three factors eating questionnaire, revised 18; revised 21 (Cappelleri et al., 2009, de Lauzon et al., 2004, Karlsson et al., 2000), PFS, power of food scale (Lowe et al., 2009); PHQ-9, patient health questionnaire-9 (Kroenke et al., 2001); SCID-I/P, structured clinical interview for DSM-IV axis I disorders, patient edition (First et al., 1995); SDS, Sheehan disability scale (Sheehan et al., 1996); SDS-17, social desirability scale (Stöber, 2001); SF-12; SF-36, short form health survey (Ware et al., 1996, Ware & Sherbourne, 1992); SSABS, semistarvation-associated behaviours scale (Hagan et al., 2002); SST, stop signal task (Logan et al., 2014); QEWP, questionnaire on eating and weight patterns (Yanovski et al., 2015); YFAS 2.0, the Yale food addiction scale version 2, (Gearhardt et al., 2016); YSQ-S2, young schema questionnaire - short form (Young et al., 2003).

^aMedian.

Goodpaster et al., 2016; Mason & Heron, 2016; Mitchell et al., 2015).

3.5 | Bariatric surgery outcomes

Eleven studies collected data on outcomes for patients following bariatric surgery (Conceicao et al., 2014, 2017, 2018; Devlin et al., 2016, 2018; Engstrom et al., 2015; Ivezaj et al., 2017, 2018, 2019; Mack et al., 2016; Mitchell et al., 2015). Across all these studies, LOC was reported by a subset of the sample at follow-up. In some cases, the prevalence of LOC developed or increased post-surgery, despite not being endorsed prior to surgery (Devlin et al., 2018). Three studies reported that a subsample of patients continued to meet sufficient diagnostic criteria for BED following bariatric surgery (Conceicao et al., 2014; Ivezaj et al., 2017; Mack et al., 2016), while another group of patients met all diagnostic criteria for BED including LOC, except for consuming a large quantity of food – termed ‘bariatric binge eating disorder’ (Bar-BED; Ivezaj et al., 2017, 2018). Across 10 studies, prevalence of LOC post-surgery was associated with increased psychological distress and impairment and/or poorer health and weight-related outcomes (Conceicao et al., 2014, 2017, 2018; Devlin et al., 2018; Engstrom et al., 2015; Ivezaj et al., 2017, 2018, 2019; Mack et al., 2016; Mitchell et al., 2015).

3.6 | Eating disorder assessment

Sixteen studies explored disordered eating and LOC prevalence in a clinical sample or subsample, consisting of individuals who met criteria for BED (Berg et al., 2014, 2015; Bodell et al., 2018; Coker et al., 2015; Dingemans et al., 2015; Goodpaster et al., 2016; Hopwood et al., 2018; Ivezaj et al., 2017, 2018, 2019; Latner et al., 2014; Legenbauer et al., 2018; Mack et al., 2016; Mitchell et al., 2015; Preuss et al., 2019; Wiedemann, Ivezaj, & Barnes, 2018). Only two of these studies reported diagnoses according to the DSM-5 criteria (Dingemans et al., 2015; Preuss et al., 2019), while the remaining studies used the DSM-IV (Legenbauer et al., 2018; Mack et al., 2016) and DSM-IV TR criteria (Berg et al., 2015; Bodell et al., 2018), or did not mention the criteria used. Of the studies that collected data on disordered eating in clinical samples, one used semi-structured clinical interviews to establish diagnoses of EDs (Goodpaster et al., 2016), while one study used a validated questionnaire (Legenbauer et al., 2018). All other studies collected data from recruited individuals that had been previously diagnosed.

3.7 | Non-clinical populations

Of the 35 included studies, 24 reported data on disordered eating and LOC in non-clinical or community samples (Aloi et al., 2017; Bodell et al., 2018; Carey et al., 2017; Coker et al., 2015; Conceicao et al., 2014, 2017, 2018; Constant et al., 2018; Devlin et al., 2016, 2018; Engstrom et al., 2015; Heriseanu et al., 2019; Hopwood et al., 2018; Kelly et al., 2018; Lane & Szabó, 2013; Latner et al., 2014; Legenbauer et al., 2018; Mason et al., 2019; Mason & Heron, 2016; Reas et al., 2019; Royal et al., 2015; Stefano et al., 2016; Stevenson et al., 2018; Wiedemann, Ivezaj, & Grilo, 2018). Twelve studies reported that LOC was associated with disordered eating behaviour or global eating pathology (Bodell et al., 2018; Conceicao et al., 2014, 2017; Constant et al., 2018; Devlin et al., 2016, 2018; Engstrom et al., 2015; Heriseanu et al., 2019; Hopwood et al., 2018; Lane & Szabó, 2013; Latner et al., 2014; Stefano et al., 2016). Six studies measured LOC as a function of grazing and found associations with other disordered eating (Aloi et al., 2017; Conceicao et al., 2017, 2018; Heriseanu et al., 2019; Lane & Szabó, 2013; Reas et al., 2019). Three studies measured LOC as a function of binge eating (subjective or objective episodes) and this was related to higher weight-related medical comorbidity (Conceicao et al., 2014, 2018; Kelly et al., 2018). One study reported that none of the participants endorsed experiences of LOC eating, though 90% of participants endorsed mindless eating (Carey et al., 2017). This study exclusively recruited male participants (Carey et al., 2017).

3.8 | LOC and binge eating

As noted, 16 studies explored associations between binge eating and LOC in a clearly defined sample or subsample of participants that met criteria for BED. A further six studies reported results of binge eating in samples not defined as clinical (Coker et al., 2015; Conceicao et al., 2018; Kelly et al., 2018; Mason et al., 2019; Mason & Heron, 2016; Royal et al., 2015; Stefano et al., 2016). Of these 22 studies, 18 reported a positive association between LOC and binge eating behaviour (Bodell et al., 2018; Coker et al., 2015; Conceicao et al., 2018; Dingemans et al., 2015; Goodpaster et al., 2016; Hopwood et al., 2018; Ivezaj et al., 2017, 2018; Latner et al., 2014; Legenbauer et al., 2018; Mack et al., 2016; Mason et al., 2019; Mason & Heron, 2016; Mitchell et al., 2015; Preuss et al., 2019; Royal et al., 2015; Stefano et al., 2016; Wiedemann, Ivezaj, & Barnes, 2018). One study reported greater LOC in people with BED and poorer set-shifting abilities (Dingemans et al., 2015), and one reported that LOC-related binge episodes were associated with greater risk of medical comorbidity (Kelly et al., 2018).

3.9 | LOC and night eating

One study used a validated scale to report on LOC and night eating (Royal et al., 2015). LOC eating was found to be associated with global ED psychopathology, including weight and shape concerns, greater psychological burden, and poorer health-related quality of life.

3.10 | LOC and grazing

Six studies primarily investigated grazing behaviour. Four of these explored grazing behaviour in a university or community sample (Aloi et al., 2017; Heriseanu et al., 2019; Lane & Szabó, 2013; Reas et al., 2019), one study investigated a sample of bariatric surgery candidates (Goodpaster et al., 2016), and one study comprised pre- and post-bariatric patients and a university sample (Conceicao et al., 2017). These studies assessed the presence of LOC via a subscale of grazing characterised by a LOC, except for one study that assessed LOC through structured clinical interviews (Goodpaster et al., 2016). Across all studies, grazing with LOC was associated with other disordered eating pathology, especially binge eating.

3.11 | LOC and emotional/stress eating

Seven studies explored behaviours related to emotional eating, stress eating, or negative affect associated with problematic eating (Berg et al., 2014, 2015; Carey et al., 2017; Constant et al., 2018; Stevenson et al., 2018; Wiedemann, Ivezaj, & Barnes, 2018; Wiedemann, Ivezaj, & Grilo, 2018). LOC was positively associated with emotional eating in two studies of participants seeking treatment for weight or eating behaviour concerns (Wiedemann, Ivezaj, & Barnes, 2018; Wiedemann, Ivezaj, & Grilo, 2018). LOC was also positively related to stress eating in a community sample (Constant et al., 2018). One study found that negative mood was a precursor to LOC eating in university students (Stevenson et al., 2018), while two studies found differing results in a sample of adults with obesity (Berg et al., 2014, 2015). These two studies reported that daily or global negative affect was not related to episodes of LOC (without overeating) but was related to discrete periods of negative emotion, particularly feelings of guilt. One study did not use validated instruments to report associations between LOC and emotional eating (Carey et al., 2017), though the authors noted that respondents reported an 'emotional antecedent' to episodes of overeating and mindless eating (e.g., feeling stressed, fatigued, angry, happy, or feeling anticipation).

4 | DISCUSSION

The primary aim of the current systematic review was to investigate LOC as a transdiagnostic feature across a range of obesity-related disordered eating behaviours, including binge eating, emotional and stress eating, night eating, and grazing. To our knowledge, this was the first review to systematically synthesise reports of LOC across a range of disordered eating behaviours in community and clinical populations, including bariatric patients.

Across the included studies, all but one reported an association between LOC and measures of disordered eating (Carey et al., 2017). However, the authors of this study claimed that there is a bias in the conceptualisation and assessment of LOC among the DSM-5 BED criteria, resulting in a reluctance for men to report LOC and thus an underestimation of true prevalence rates among males. Further, as was evidenced in studies with non-clinical and community samples, LOC was associated with reports of binge eating that do not meet clinical criteria (Bodell et al., 2018; Heriseanu et al., 2019; Kelly et al., 2018; Mason & Heron, 2016; Stefano et al., 2016). In a longitudinal study measuring health and eating habits in the community, LOC compared to objective episodes of overeating was related to greater impaired psychosocial functioning, after controlling for depressive symptoms, maladaptive cognitions about food, weight, and body shape (Mason & Heron, 2016). Similarly, in a community sample of males that assessed body image and eating behaviours, it was found that those who engaged in either objective or subjective binge episodes were at the highest risk of weight-related medical comorbidities (Kelly et al., 2018). This suggests that LOC affects health-related outcomes above the amount consumed. Further, LOC was highly correlated with ED pathology and significantly predicted the frequency of binge eating episodes (Bodell et al., 2018; Stefano et al., 2016). Finally, in a sample of adults seeking obesity treatment, reductions were seen across binge eating, emotional eating, and LOC following a dietary intervention (Mason et al., 2019). These findings suggest that LOC presents an issue not only for clinical populations with BED or bariatric surgery candidates but also among non-clinical populations engaging in subjective binge episodes or other subclinical disordered eating.

Across community samples, measures of global eating pathology were used to assess problematic eating behaviours, with associations found between global eating pathology and LOC (Bodell et al., 2018; Heriseanu et al., 2019; Latner et al., 2014; Stefano et al., 2016). This correlates with clinical studies that have explored associations between emotional eating, night eating (Royal et al., 2015), grazing, and LOC (Conceicao et al., 2015;

Goodpaster et al., 2016; Reas et al., 2019). Taken together, these findings contribute to classifying LOC as the transdiagnostic eating feature that presents across eating behaviours in both clinical and community samples. Clinically, this suggests that treatment for obesity and disordered eating could be enhanced by focussing on transdiagnostic features such as LOC.

As an independent construct, LOC can be reliably measured across populations. In a sample of individuals with and without BED, self-report measures of disordered eating supported the ELOCS as a reliable and valid measure of LOC. Further, the LOC construct was shown to be similar across clinical and non-clinical populations and was endorsed by non-clinical populations despite not meeting criteria for other EDs (Hopwood et al., 2018). In addition, disordered eating behaviours such as objective and subjective binge episodes and compulsive and non-compulsive grazing should be considered in relation to varying degrees of LOC (Conceicao et al., 2015). For example, Conceição et al. proposed a continuum, with objective binge episodes associated with the greatest severity of LOC and the lowest severity with non-compulsive grazing (Conceicao et al., 2015). Future research could consider LOC as such. Furthermore, in a sample of international female adoptees, women displayed significantly higher levels of self-induced vomiting, LOC eating, preoccupation with food, being underweight, and a desire for thinness compared with non-adoptee women (Strand et al., 2019). The finding that LOC presents across those underweight with compensatory weight behaviours or with a desire for thinness, may suggest that LOC is a transdiagnostic feature that presents across restrictive eating disorders as well (Strand et al., 2019). Nevertheless, this area was not the focus of the current systematic review and further investigation is encouraged to extrapolate this position.

4.1 | Implications for bariatric surgery patients

Data from 2017 to 2018 showed that over two-thirds of Australian adults had obesity or were overweight, and that weight loss surgeries had been increasing over this time (Australian Institute of Health and Welfare, 2019; American Society for Metabolic and Bariatric Surgery, 2020). Despite health guidelines endorsing lifestyle modifications for reducing weight and improving metabolic health, many individuals experience challenges maintaining initial weight loss or long-term behaviour changes in eating (Amianto et al., 2015; Gade et al., 2014). For example, engaging in disordered eating behaviours (e.g., binge eating) predicted poorer outcome for weight loss,

with individuals often regaining weight once treatment ceased (Edwards-Hampton & Wedin, 2015; Grilo et al., 2011). When other treatment options have been unsuccessful, bariatric surgery is often sought as a treatment to regain control over the management of weight and maladaptive eating patterns (Colles et al., 2008b). Although bariatric surgery is an effective intervention for obesity, disordered eating patterns often remain following surgery and are associated with poorer weight outcomes (Conceicao & Goldschmidt, 2019; Gade et al., 2014). Further, many patients undergoing bariatric surgery show weight regain following intervention and some fail to benefit psychosocially, despite research indicating potential benefits in psychosocial outcomes (White et al., 2010). Even with attempts to characterise specific variables that may predict outcome following surgery, few psychosocial factors have reliably predicted successful weight loss or improved psychosocial functioning following bariatric surgery. As a result, focussing on specific eating behaviours such as LOC eating, may prove more useful (Conceicao et al., 2015; Utzinger et al., 2016). Interestingly, LOC eating prior to bariatric surgery may predict its occurrence post-operatively and has been investigated as a prognostic indicator of problems arising post-surgery (Gade et al., 2014; Sarwer et al., 2019; Spirou et al., 2020). LOC occurring post-operatively has also been linked with poorer weight management and quality of life and greater emotional distress following surgery (Carr et al., 2019; Conceicao et al., 2015; Conceicao & Goldschmidt, 2019), a clinical profile that warrants a potential area for intervention. Even after binge episodes are reduced, LOC as a disordered eating feature remains and reflects poorer outcomes. Importantly, researchers have contended that psychopathology related to disordered eating behaviour show stronger associations with a degree of LOC rather than the amount of food consumed (Conceicao & Goldschmidt, 2019). Given the reduced volume available for consumption following bariatric surgery, binge episodes are likely to decrease and thus LOC eating among bariatric surgery patients may present in behaviours other than binge episodes. For example, grazing, emotional eating, or night eating may reflect a LOC when individuals are physically unable to engage in binge episodes (Conceicao & Goldschmidt, 2019). This emphasises the importance of conducting comprehensive psychological assessments to identify potential disordered eating behaviours that may impact successful long-term outcomes.

Overall, this review found that of the 11 studies that reported outcomes for patients following bariatric surgery, LOC was consistently an issue across a subset of the sample. Further, although bariatric patients frequently failed to meet full criteria for BED due to a physical

inability to consume an objectively large amount of food, they often met criteria for 'bariatric binge eating disorder' (Bar-BED; Ivezaj et al., 2017). These patients also continued to experience LOC with eating following surgical intervention, which is associated with increased psychological impairment and distress, poorer health-related quality of life, and poorer weight-related outcomes (Ivezaj et al., 2017, 2018). These findings support previous studies that found poorer weight outcomes for those endorsing LOC following bariatric intervention (Conceicao et al., 2014; Devlin et al., 2016; Engstrom et al., 2015; Wiedemann, Ivezaj, & Grilo, 2018). They also highlight the importance of accurately screening candidates prior to surgery to assess those at risk of poorer outcome and to ensure adequate and ongoing support can be provided to target these unhelpful eating behaviours.

4.2 | Clinical and research implications

This systematic review provided evidence that LOC presents as a transdiagnostic feature across disordered eating and may underlie other problematic or disordered eating behaviours. This finding has several clinical and research implications. First, it highlights the importance of examining the occurrence and degree of LOC during clinical assessments of EDs. Clarifying the presence of LOC may help to reveal a critical component underlying problematic or disordered eating behaviours, and thus appropriately guide clinical intervention. This will contribute to improving clinicians' ability to differentiate the key characteristics of disordered eating behaviours. Research has shown that even when healthcare practitioners and psychiatrists agree on what constitutes over-eating and LOC, the majority cannot correctly identify BED symptoms (Chao et al., 2019). Taken with the finding that the conceptualisation of LOC may differ across gender (Carey et al., 2017) and may be difficult to precisely recall, the challenge of accurately identifying EDs and disordered eating patterns is exacerbated. As a result, researchers and clinicians should consider utilising a multi-method approach to assessing LOC, including validated self-report questionnaires (e.g., LOCES, ELOCS), semi-structured psychological interviews, and ecological momentary assessment procedures.

Second, the assessment and treatment of LOC may be especially critical for certain clinical populations such as bariatric candidates. As objective binge eating is not anatomically possible following bariatric surgery, other disordered eating behaviours such as LOC eating may persist or develop (Spirou et al., 2020). Irrespective of the weight gain associated with LOC eating, this pattern may

be clinically distressing for patients and may affect their mental health and quality of life. For example, more severe LOC has been associated with significantly greater levels of depressive symptomology, greater dissatisfaction with self-image, and poorer mental health-related quality of life (Bodell et al., 2018; Stefano et al., 2016). Therefore, multi-method psychological assessments prior to and following surgery should incorporate the measurement of LOC to identify candidates potentially at risk of poor prognostic outcome.

Third, LOC in eating may be one of several areas that individuals experience difficulties with control and may reflect more global concerns with executive functioning. Supporting this view, research has demonstrated a link between disordered eating behaviours and difficulties with cognitive flexibility as well as other executive skills (Edwards et al., 2018; Raman et al., 2013, 2020). Further, in a clinical sample of women with BED, it was found that individuals with poorer set-shifting abilities were more affected by negative changes in mood and subsequently reported experiencing more feelings of LOC with eating compared to those with greater set-shifting abilities (Dingemans et al., 2015). These findings correlate with previous literature that suggested the presence of disordered eating behaviours and EDs may be associated with impaired executive function skills relating to inhibitory and self-regulatory control (Manasse et al., 2014; Raman et al., 2013, 2020; Svaldi et al., 2010). Interestingly, cognitive remediation therapy has demonstrated promising findings and improvements for individuals with obesity and poor executive skills (Allom et al., 2018; Raman et al., 2018), further highlighting the role of executive function in obesity and disordered eating. Future research could explore the directional relationship between LOC in eating and executive function deficits as well LOC more broadly across other areas of functioning.

4.3 | Strengths and limitations

The findings of this review should be considered in light of three main limitations. First, the majority of studies utilised the criteria of the DSM-IV TR, which was prior to the introduction of the formal BED diagnosis in the DSM-5. Even though the classification of eating and feeding disorders had been updated, studies continued to use outdated criteria, which is concerning as this represents a deviation from evidence-based practice. Similarly, utilising outdated diagnostic criteria may have implications on the conceptualisation of certain disordered eating behaviours and ED constructs, and may inadvertently influence findings and clinical intervention. It is unclear whether

this would have affected the recruitment of participants that may have experienced LOC and were otherwise excluded for not meeting clinical levels of BED. Participants that met a 'subclinical' threshold of BED and also experienced LOC may have further contributed to the notion that LOC is a transdiagnostic feature. Importantly, people that have not met the full criteria for a diagnosis of BED yet report subjective binge episodes (e.g., post-bariatric surgery patients), still demonstrate an elevated risk of experiencing psychological distress and may benefit from targeted clinical intervention (Colles et al., 2008b). Ideally, as more studies utilise the current BED criteria, updated systematic reviews could be compared to this review to support the validity of these results. In addition, expanding the search limiters to studies prior to the DSM-5 may further investigate the relationship between LOC and disordered eating.

Second, the LOC construct is subjective, which presents difficulty in quantifying the occurrence relative to other behavioural indicators. The assessment of LOC relies on the respondents' ability to accurately recall their experience. In other words, it requires a degree of reflective awareness. However, respondents may lack the awareness to recall and report these experiences, especially when that experience is characterised by a LOC. This is further complicated when studies use varied approaches to measuring the construct of LOC. In addition, the sense of *losing control* may be influenced by cultural expectations and biases, which may further complicate the validity of measuring one's experience of LOC. Future research should continue to examine the influence of social and cultural biases on weight and EDs as well as exploring the differences in LOC across sex, especially through multi-method approaches. Similarly, future research should examine the LOC construct among studies published in languages other than English. As the current study exclusively investigated studies in English, cultural variations in this construct may not have been captured. Further, considering ecological momentary assessment may yield promising results in assessing LOC at the moment of its occurrence, which may add to the measurement of LOC.

Third, given the nature of the construct of LOC in eating, it is often observed in adults with a high BMI who explore bariatric surgery as a treatment. As such, while care has been taken to include studies of non-clinical populations, there remains a large overlap of bariatric populations and studies that explore LOC eating, which may influence the relationships observed. Moreover, this review considered ED behaviours and LOC in adults, though previous literature has also investigated LOC in

children and adolescents. Although it is beyond the scope of this study, future studies could investigate LOC eating in childhood and adolescence.

5 | CONCLUSION

The current systematic review was the first to explore LOC as a transdiagnostic feature across obesity-related eating behaviours. Overall, the findings from this review provide support for LOC as a transdiagnostic feature, with associations found between LOC and grazing, binge eating, night eating, emotional and stress eating, and measures of global eating pathology. Further, LOC was associated with increased psychopathology, poorer quality of life, and poorer prognostic outlook for bariatric patients following surgery. Associations between LOC and measures of disordered eating were also found in both clinical and community populations. It should be noted, however, that there was an inconsistent measurement of LOC across studies with several studies not including an independent measure of LOC or only assessing through one method (e.g., self-report). Future research should continue to explore LOC using a multi-method approach (e.g., validated self-report questionnaires, semi-structured psychological interview, and ecological momentary assessment). Furthermore, addressing LOC in eating through evidence-based psychological interventions may contribute to improved outcomes in the field of EDs and bariatric psychology.

5.1 | What is already known on this subject?

Disordered eating behaviours are high risk factors for developing eating disorders and obesity. Many disordered eating behaviours show some degree of LOC.

5.2 | What does this study add?

LOC is found to be a transdiagnostic feature across a range of disordered eating behaviours and should be considered in clinical interventions, yet methods of assessing LOC remain inconsistent.

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CONFLICTS OF INTEREST

The authors have no competing interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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