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Abstract

Background: Bariatric surgery is considered an effective obesity management intervention for individuals with a BMI greater than 40, or 35 with co-morbidities. However, research documents that psychological difficulties prevalent amongst individuals seeking surgery may persist post-operatively. This systematic review aims to assess the evidence to show which psychosocial interventions support psychological well-being post-operatively. Methods: The review is registered with Prospero (CRD42018100280) and complies with PRISMA guidelines. The research protocol included grey literature and database searches of psychosocial interventions for post-operative bariatric patients, between November 2017 and September 2019. The primary outcome was psychological well-being; secondary outcomes included weight loss maintenance and quality of life. The primary reviewer screened titles and extracted data. Study quality was assessed independently by two reviewers, using the Effective Public Health Practice Project criteria. Due to heterogeneity across studies, narrative synthesis was considered suitable for data analysis. Results: Ten studies met inclusion criteria. Psychosocial intervention content was delivered in a variety of ways (e.g., clinic, internet-based). Overall, participants (N=382, Mage = 46.4) receiving psychosocial interventions post bariatric surgery, demonstrated improvements in psychological well-being and weight loss maintenance, compared to baseline measures and/or controls. The strength of evidence is currently limited by the small number of studies found and study quality, limiting the power to detect clinically meaningful changes; findings should therefore be considered preliminary. Conclusion: Preliminary findings suggest that interdisciplinary interventions including acceptance-based approaches, psycho-education, nutrition and lifestyle modification, delivered 1-year post-operative, are promising. Further scientific enquiry is warranted with well-designed studies and long-term follow-ups.

Keywords	post-operative; bariatric surgery; psychosocial interventions; psychological well-being; interdisciplinary; psycho-education; nutrition; lifestyle modification
Taxonomy	Bariatric Surgery, Obesity Management, Preventing Weight Regain
Manuscript region of origin	Europe

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What is known: Bariatric surgery is considered an effective weight management tool, however without appropriate post-operative interventions supporting psychological and physical well-being, long-term health outcomes are variable. Pre-existing psychological concerns may persist post-operatively with negative consequences. Furthermore, around 30% of bariatric surgery patients regain weight from 18-24 months post-operatively, and between 30-70% are unable to maintain 20% of their weight loss, 10-years post-operatively.

Highlights: Preliminary findings suggest that flexible interdisciplinary interventions including acceptance-based therapy, psychoeducation, nutrition and lifestyle modification, delivered 1-year post-operatively, are promising for managing long-term psychological well-being and weight loss in post-operative bariatric surgery patients.

Key words: obesity; weight gain; post-operative; bariatric surgery; gastric bypass; psychological well-being; nutrition; lifestyle, psychosocial interventions; acceptance commitment therapy; mindfulness; cognitive behavior therapy; psychoeducation.

Funding and declaration of interests

The authors declare no conflict of interest and received no funding to undertake this review.

Statement of ethical standards: The authors have read and abided by the statement of ethical standards for manuscripts submitted to the Obesity Research & Clinical Practice.

Abstract

Background: Bariatric surgery is considered an effective obesity management intervention for individuals with a BMI greater than 40, or 35 with co-morbidities. However, research documents that psychological difficulties prevalent amongst individuals seeking surgery may persist post-operatively. This systematic review aims to assess the evidence to show which psychosocial interventions support psychological well-being post-operatively.

Methods: The review is registered with Prospero (CRD42018100280), complying with PRISMA guidelines. The research protocol included grey literature and database searches of psychosocial interventions for post-operative bariatric patients, between November 2017 and September 2019. The primary outcome was psychological well-being; secondary outcomes included weight loss maintenance and quality of life (QoL). The primary reviewer screened titles and extracted data. Study quality was assessed independently by two reviewers, using the Effective Public Health Practice Project criteria. Due to heterogeneity across studies, narrative synthesis was considered suitable for data analysis.

Results: Ten studies met inclusion criteria. Psychosocial intervention content was delivered in a variety of ways (e.g., clinic, internet-based). Overall, participants (N=382, *M*age = 46.4) receiving psychosocial interventions post bariatric surgery, demonstrated improvements in psychological well-being and weight loss maintenance, compared to baseline measures and/or controls. The strength of evidence is currently limited by the small number of studies found and study quality, limiting the power to detect clinically meaningful changes; findings should therefore be considered preliminary.

Conclusion: Preliminary findings suggest that interdisciplinary interventions including acceptance-based approaches, psychoeducation, nutrition and lifestyle modification, delivered 1-year post-operative, are promising. Further scientific enquiry is warranted with well-designed studies and long-term follow-ups.

1. Introduction

Obesity is a worldwide public health problem, associated with reduced life expectancy and serious health conditions[1]. Treatments for obesity depend on reducing hunger, and the association of food with positive affect, emphasising the importance of both physiological and psychological factors in obesity management[2]. Bariatric surgery (BS) has demonstrated superior results compared to psychological interventions[3 4 5 6]. However, BS alone does not guarantee weight loss, dietary and lifestyle modification are also required[7]. Research demonstrates variability at follow-up in BS outcomes, with improvements observed for some while not for others (e.g., weight regain, low mood)[8]. Studies show that BS patients achieve their greatest weight loss within one-year after surgery[9]. Approximately 30% of patients regain weight from 18-months to 2-years post-operatively[10], with 30-70% unable to maintain 20% of weight loss, 10 years post-operatively[11]. Individual differences among BS patients may account for this variability, including low self-efficacy[12], poor self-management[13,] and differences in psychosocial status[6]; heightened by the deterioration of physical and metabolic effects of surgery[14]. Literature documents the prevalence of pre-operative psychological morbidity amongst those seeking BS that persists post-operatively[15 16 17] which, if not addressed, can undermine the efficacy of the surgical intervention[15]. Chacko and colleagues[10] state that emotional eating in response to psychological distress is considered a significant risk factor for poor post-operative outcomes among bariatric patients. With no successful weight loss prior to BS, individuals with pre-existing psychological difficulties are more likely to engage in maladaptive behaviour post-operatively[13]. Some patients experience psychological difficulties in accepting post-operative results, including loose skin or body shape changes[15], indicating the need for psychosocial interventions that support psychological adjustment[18]; where patients develop the psychological skills required to manage their post-operative healthcare needs[19]. Therefore, it is important to integrate psychosocial input into the care pathway for BS patients.

NICE[20] and ACE/TOS/ASMB0 [1][14] guidelines recommend a multidisciplinary approach to BS, incorporating pre- and post-operative psychological support. Although BS patients undergo pre-surgical assessments and patient-education in preparation for life post-operatively[2], this provision is not uniform across providers[21]; pre and post psychological support is rare[18]. Moreover, no current guidelines state which interventions are clinically effective or when to deliver them[22]. However, Leahey and colleagues[23] found that when compared with pre-operative patients, post-operative patients were more likely to attend and complete intervention sessions, suggesting that the best time to deliver interventions is post-operatively. Furthermore, Peacock and Zizzi[24] found a statistically significant relationship between the number of post-operative care sessions BS patients attended, and weight loss maintenance.

Arguably, intervention type and delivery timing are important considerations. Traditional behavioural interventions incorporating dietary and lifestyle modification, though potentially effective short-term, are not generally effective for long-term weight-loss maintenance[10]. Instead, Weineland

[1] American Association of Clinical Endocrinologists / The Obesity Society / The American Society for Metabolic and Bariatric Surgery

and colleagues[25] argue that interventions should place emphasis on addressing the psychological determinants of behaviour (e.g., psychological flexibility). Emerging studies suggest that post-operative acceptance[26] and mindfulness-based interventions[10 15 27], including cognitive behavioural therapy (CBT)[28] and/or dialectical behavioural (DBT) strategies[29], may be effective for reducing disordered eating behaviour and improves weight loss management. Studies evaluating post-operative interventions to address the psychological wellbeing of BS patients, are sparse and heterogenous[30]. Therefore, this systematic review aimed to identify and assess the evidence of effectiveness of interventions to support psychological well-being post-operatively.

2. Methods

Protocol registration CRD42018100280 on the 27.7.2018

2.1 Types of studies

Randomised control trials (RCTs), controlled clinical trials, cohort analytic studies (two groups pre-post) and cohort studies (one group pre-post) reporting on original research regarding post-operative psychosocial interventions, which support psychological well-being for bariatric patients. No post-operative period was imposed. Review studies were excluded.

2.2 Participants

Male and female, post-operative bariatric patients aged 18 to 65, with a BMI over 35. Studies involving patients experiencing significant psychopathology (e.g. psychotic disorders; personality disorders; suicidal ideation), cognitive or language disability were excluded.

2.3 Types of interventions

Psychological, behavioural or psychoeducational (i.e., dietary and lifestyle guidance) interventions delivered post-operatively, compared with baseline measures (i.e. pre-post measures) or controls (i.e. usual/standard care). Pre-operative interventions were excluded.

2.4 Types of outcome measures

The primary outcome was psychological well-being encompassing improvements in: body satisfaction; self-esteem; mental health; self-efficacy; self-control; eating behaviour; and improved self-care. Secondary outcome variables were long-term weight loss maintenance and improved QoL. Tertiary outcomes included lifestyle modification such as physical activity and improved diet. Outcomes concentrating on weight loss and/or adherence to post-operative guidelines only, were excluded.

2.5 Search strategy for identification of studies

Using a combination of search terms (Figure 1) the following databases were searched between November 2017 and September 2019: Medline via EBSCO and OVID; PsycInfo; EMBASE; Cochrane Library; PubMed; Science Direct; Scopus; Wiley; Sage Journals; SpringerLink; and Google Scholar. Grey literature included: The National Obesity Forum; HOOP UK; Obesity Health Alliance;

Obesity Action and Weight Concern; and The British Obesity Society. Online social media groups were contacted: Weight Loss Surgery UK and Gastric Bypass Sleeve & Lap Band Weight Loss Support (WLS) United Kingdom. Reference lists of recent reviews were consulted[2 6 22 31]. Experts in the field were e-mailed. Only Sandra Jumbe; specialist in psychological adjustment post-bariatric surgery, responded.

Figure 1. Search terms

Psychosocial interventions AND gastric bypass
Psychological interventions AND post-gastric bypass
Psychosocial interventions AND post-gastric bypass AND psychological wellbeing
Psychological interventions AND post-gastric bypass
Post-gastric bypass AND psychosocial interventions
Psychotherapeutic interventions AND post-gastric bypass
CBT interventions AND post-gastric bypass
Mindfulness interventions AND post-gastric bypass
Psychoeducation AND post-gastric bypass
Support groups AND post-gastric bypass
Effective psychosocial interventions post-gastric bypass
Psychological wellbeing AND post-gastric bypass
Psychotherapy AND post-gastric bypass
Group therapy AND post-gastric bypass

2.6 Data collection and analysis

2.6.1 Selection of studies

The first author screened titles and abstracts to identify study eligibility. Due to scientific innovation in bariatric surgery[32] and aftercare[21] a ten-year limit was imposed. Non-English papers were excluded due insufficient funds for translation.

2.6.2 Data extraction and analysis

Data was initially extracted by the first author, using the data extraction form (appendix B), and independently verified by the second author. The Effective Public Health Practice Project (EPHPP)[33] (appendix C) was used to assess study quality. Observing the Centre for Reviews and Dissemination's (CRD) guidance for health care reviews[34], a meta-analysis was discounted due to heterogeneity between studies. Instead a narrative synthesis was conducted, adhering to methodological guidance outlined in Popay et al[35]. Findings were reported using The Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) framework[36].

3. Results

Table 1. (appendix A) presents an overview of selected studies using the template for intervention description and replication (TIDieR)[37].

3.1 Overview of studies

The initial title search yielded 3182 studies, minus duplicates. Ten studies were included in the review (Figure 2. The PRISMA flowchart[38]). Studies were conducted in Germany, Sweden, Greece, Canada (n=2) and the USA (n=5). Psychosocial interventions were delivered via: clinic-based groups (n=5); clinic-based groups plus individual sessions (n=1); clinic, telephone and internet sessions (n=1); clinic and telephone sessions (n=1); telephone and internet sessions (n=1) and telephone only sessions (n=1). Therapeutic modalities were utilised in isolation or in combination: CBT (n=2), CBT and DBT (n=1), CBT and mindfulness (n=1), mindfulness (n=1), acceptance commitment therapy (ACT) (n=2) and comprehensive psychoeducation, nutrition and lifestyle programs (n=3). All studies (Table 1) reported findings, though reporting methodology was inconsistent across studies making comparisons difficult.

3.2 Quality assurance

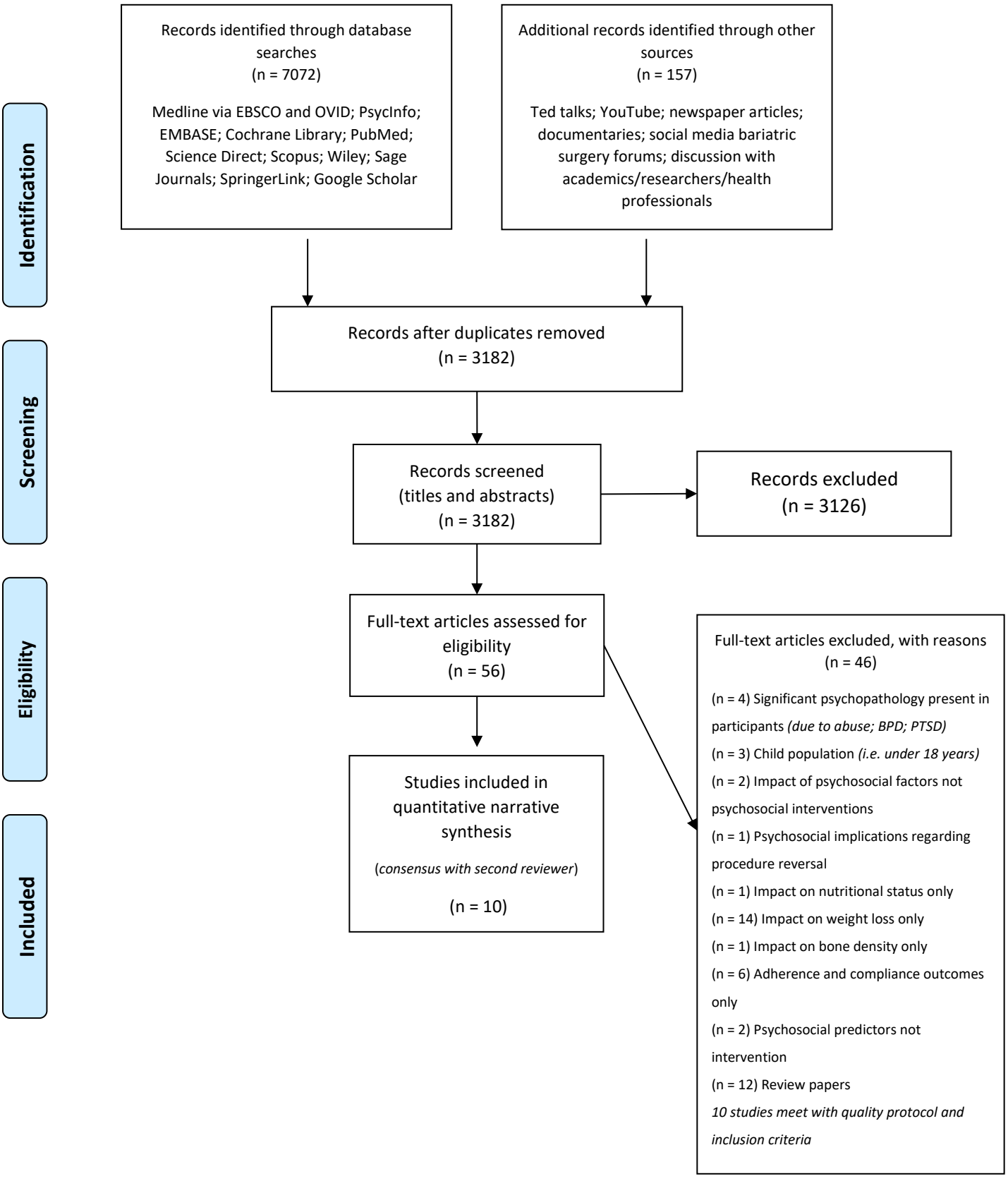
One pilot RCT, three pilot cohort studies, two cohort analytic studies, one cohort study and three RCTs, reported original research regarding the impact of post-operative psychosocial interventions for bariatric patients. Using the EPHPP[33] quality assessment tool, five studies[7 10 26 27 30] were rated moderate and five studies[11 15 28 29 39] were rated weak. All studies (Table 1) reported retention rates and used reliable, validated outcome measures.

3.3 Representativeness

Combined studies included 382 post-operative BS patients (band, sleeve or bypass surgery); predominantly Caucasian females; aged between 18 and 65 years (*M*age of 46.4); classified as severely obese (BMI > 40kg/m^2); with a history of multiple failed weight loss attempts in the absence of severe psychopathology. The most prevalent participant reported co-morbidities were hypertension, diabetes and hyperlipidaemia; depression and anxiety reported by some. Sample size ranged from 7[15] to 144[27]. Baseline characteristics and group differences were reported for all studies. Sample characteristics representative of the UK BS patient population[5], are summarised in Table 1.

Figure 2. PRISMA 2009 Flow Diagram

A systematic review of psychosocial interventions that support psychological well-being in post-operative bariatric surgery patients



3.4 Interventions

Psychosocial interventions delivered for post-operative bariatric patients included, cognitive behavioural therapy, mindfulness, acceptance commitment therapy, nutrition and lifestyle modification and psychoeducation (Table 1, appendix A).

3.4.1 Cognitive behavioural therapy

Clinic-based group

Beaulac and Sandre[39] investigated the impact of group CBT psychotherapy on obesity-specific behaviour. Significant reductions were observed in patients' psychological distress and perceived life-difficulties. Improvements in weight-related adjustment, maintained at three-month follow-up, showed large effect sizes. Emotional overeating and relationship anxiety improved; though not statistically significant[39]. The sample size was small, with no comparison group and self-report measures were used in the pilot study of weak quality. It was difficult to determine whether findings were due to the intervention or other effects. Preliminary findings suggest that short-term clinic-based group CBT psychotherapy could be beneficial for enhancing the psychological wellbeing for post-operative BS patients.

Telephone-based

Sockalingam and colleagues[28] explored the efficacy of post-operative telephone delivered CBT (Tele-CBT) for improving psychosocial functioning and disordered eating. Results showed significant improvements in eating behaviour, anxiety and depressive symptoms, with large effect sizes for symptom reduction across domains[28]. The pilot study of weak quality had a small sample with no control group. It was difficult to differentiate between surgical and Tele-CBT effects; therefore long-term efficacy is unknown. Preliminary findings suggest that post-operative Tele-CBT is feasible, and can improve symptoms of psychopathology in BS patients over a wide geographic region; adding support to previously reported findings[40 41].

3.4.2 Cognitive behavioural therapy and dialectical behaviour therapy

Clinic-based group

Himes and colleagues[29] piloted an intervention utilising CBT and DBT techniques to treat BS patients experiencing depressive symptoms, poor eating behaviour and weight regain. Treatment components addressed behavioural accountability, adherence to post-operative recommendations and stress management; followed by an introduction to stepped care for weight management[29]. Completers experienced slight improvements in mood and moderate improvements in eating behaviour and weight loss[29]. This pilot study had a small Caucasian sample and relied on self-report data. Initial findings provide weak evidence regarding the efficacy of tailored interventions for BS patients, experiencing mood and eating disorders associated weight regain, using a stepped care approach[31]; supported by other studies[4 13 42]

3.4.3 Cognitive behavioural therapy and mindfulness

Clinic-based group

Leahey and colleagues[15] investigated the impact of a 10-week group CBT mindfulness-based intervention (MBI), designed to reduce binge-eating behaviour and improve well-being. The intervention targeted individuals with post-operative eating difficulties to facilitate their adjustment to post-operative requirements. Findings showed improvements with large effect sizes in binge eating symptoms, depression, emotion regulation, and increased motivation to change maladaptive eating behavior[15]. With a small sample, no comparison group and reliance on self-report measures, this study provides weak evidence for CBT MBI interventions for binge-eating in post-operative BS patients. Nonetheless, findings are consistent with more recent CBT[39] MBI[10] studies.

3.4.4 Mindfulness

Clinic-based group

Chacko and colleagues[10] delivered a MBI to prevent post-operative weight regain. Although, compared with standard care (SC), the intervention group reported a significant reduction in emotional eating at 6-month follow-up, they also reported increased perceived stress and depression with no observed improvement in weight loss[10]. Arguably this could be due to the potential for MBI to uncover underlying psychological issues, however this may benefit BS patients long-term, where strategies are in place to manage these psychological issues (e.g., coping and reframing strategies)[10]. During qualitative interviews participants reported improvements in eating behaviours, reduced stress reactivity and requested further MBI support. This small pilot RCT of moderate quality, had a predominantly female Caucasian sample, with no time-matched control group, making it difficult to determine the effects of MBI versus SC[10]. Results are not generalizable, and the qualitative aspects allowed for response bias. Preliminary findings do however suggest that MBI may be useful for treating emotional eating; consistent with findings[15 26 43 44 45 46] in the literature.

3.4.5 Acceptance commitment therapy

Clinic, telephone and internet-based

Weineland and colleagues[26] delivered a short-term, internet-based ACT intervention. Compared with the usual care (UC) group, significant improvements in QoL and body dissatisfaction (large and medium effect sizes respectively) were found in the intervention group (IG) at 6-months[26]. Both groups showed improvements in disordered eating behaviours. The IG also showed comparative improvements in acceptance of previously avoided weight-related thoughts and feelings[26]. This RCT shows that psychological treatment can produce long-term benefits for BS patients; psychological flexibility[26] is considered as the mechanism of change. This study had predominantly female participants. UC controlled for non-specific psychological effects and the timing of treatment in the sample was too broad (4-38 months) for follow-up weight analysis[26]. Irrespective, this study with a moderate quality rating, provides evidence supporting the utility of the ACT treatment model in enhancing psychological flexibility, for optimizing BS outcomes; consistent with findings[4 10 25 47] reporting positive ACT effects on obesity-related stigma, eating behaviour and QoL.

Telephone and internet-based

The Bradley and colleagues[11] remotely delivered intervention for weight regain following BS, reported clinically significant weight loss, with medium to large effects in eating behaviour (e.g., loss of control; responsivity to food cues) and acceptance-based variables (e.g., defusion), which mirrored improvements observed in their earlier study[48]. Weight loss was double (-5.9kg) at 3-months follow-up, than that observed (-3.3kg) in another SC intervention[49] at 6-months follow up; particularly notable because BS patients typically regain weight from this timepoint[4]. The open trial study design does not allow outcomes to be definitively attributed to the intervention, and the impact of the phone coach on outcomes is unknown[11]. The study had a small sample recruited form a small geographic area, a short-follow-up period, and relied on self-report measures[11]. Findings, with a weak quality rating, provide evidence to support remotely delivered, acceptance-based interventions for weight regain post BS; backing earlier studies[26 28 50]. Furthermore, findings are consistent with earlier studies regarding the application of remotely delivered acceptance-based therapies (ABTs), including those for type 2 diabetes[51], anxiety[52] and depression[53].

3.4.6 Nutrition and lifestyle-modification

Clinic based group and individual sessions

Papalazarou and colleagues[7] were the first to design and evaluate a lifestyle intervention (i.e., behavioural modification, nutrition, physical activity) for BS patients. Compared with UC, the IG showed significant improvements in eating behaviour, physical activity and maintained weight loss 3-years post-surgery[7]. The intervention also targeted realistic weight loss expectations, healthy food choices (e.g. shopping; eating out), flexible eating patterns and portion control, supporting BS patients' adjustment to post-operative lifestyle requirements[7]. The sample size was moderate, however all participants were female with gastric banding surgery, limiting the generalizability of results to other groups of interest (i.e., BS patients with sleeve gastrectomy or gastric bypass; male BS patients)[7].These findings provide evidence of moderate quality, in support of a post-operative lifestyle intervention tailored for BS patients[54 55].

Clinic based group

Nijamkin and colleagues[27] evaluated a comprehensive post-operative behavioural-motivational nutrition-education intervention, which placed emphasis on developing strategies to support lifestyle change (i.e., set realistic exercise targets; manage emotional eating; overcome barriers; improve self-esteem and motivation; and manage depression). The IG showed significant improvements in depression and weight loss compared to those receiving UC, but no effect size was reported[27]. The sample was Hispanic-American limiting generalisability to other groups, and longer-term follow-up is required to establish sustained effects[27]. Consistent with other findings[56 57 58 59], this RCT with a moderate quality rating, provides evidence supporting delivery of a comprehensive post-operative intervention that improves psychological well-being and supports weight loss post BS.

3.4.7 Psychoeducation

Clinic-based group and internet-based videoconferencing

The Wild and colleagues[30] Bariatric and Surgery Education (BaSE) multicentre RCT, evaluated an intervention targeting patient compliance and competence, by supporting patients to manage physiological and psychological challenges associated with BS (i.e., stress management; physical activity; relaxation and self-care). Compared with UC, the IG reported significant improvements in self-efficacy (SE) scores and depression severity at follow-up[30]. The retention rate was 63.2%, limiting reliability of results. Confounding variables that influence weight loss were not considered (e.g., menopause, smoking cessation)[30]. Self-report data was used and only means were reported. This study with a moderate quality rating, provides evidence that psychoeducation shows sustained effects. Aligned with previous findings[7 9 60], Wild and colleagues[30] suggest that interventions encouraging new habits and coping strategies during the first-year, when weight regain is likely, may facilitate longer-term adjustment and weight management. In this respect, Wild and colleagues[30] advocate a stepped care approach; supported by other studies[4 13 29 42], where patients receive low level monitoring during the first year, with those 'at risk' offered a programme such as BaSE.

3.5 Summary

- Clinic-based CBT psychotherapy could be beneficial for enhancing the psychological wellbeing[39].
- Post-operative Tele-CBT may improve symptoms of psychopathology over a wide geographic region[28]
- Clinic-based tailored interventions (i.e., CBT, DBT, stress management) may reduce symptoms of mood and eating disorders associated weight regain, using a stepped care approach[29 30]
- Clinic-based CBT-MBI interventions may improve binge-eating behaviour[15]
- MBI may reduce emotional eating behaviour[10]
- Clinic, telephone and internet-based ABTs may enhance psychological flexibility[25 26]
- Acceptance-based interventions delivered remotely may reduce weight regain[11]
- Tailored clinic-based post-operative lifestyle interventions may improve eating behaviour, physical activity and maintain weight loss[7]
- Comprehensive clinic-based post-operative intervention may improve psychological well-being and support weight loss[27]
- Clinic-based and videoconferencing psychoeducation may lead to better long-term weight management coping strategies[30]

3.6 Study quality

Several factors limit the reliability of findings across studies. The absence of control or comparison groups[11 15 28 29 39] makes it difficult to distinguish between intervention effects and other uncontrolled factors. High attrition rates introduce further bias[15 30]. Apart from Nijamkin et al[27] with a

sample of 144 participants, small sample sizes across studies limit statistical power to detect clinically significant effects[10 11 15]. Studies with short-term post-operative follow-up[39], limit evaluation of long-term intervention effects. The validity of self-report data can be problematic with incomplete or incorrectly recorded data[29 61]. Lastly, participants may not represent the larger post-operative BS population[7 10 27 29]. Nevertheless, the contribution these studies make to the field is valuable. The implications for post-operative BS patients are now discussed, followed by recommendations for future studies.

4. Discussion

Bariatric surgery is on the increase, yet a majority of BS patients experience significant challenges (e.g., persisting psychological disorders) and do not achieve positive post-operative outcomes[4 13]. Therefore, effective post-operative interventions for BS patients that support both physical and psychological well-being and improve QoL[42 62] are required. This review evaluated the effectiveness of psychosocial interventions to improve psychological well-being in post-operative bariatric patients. Overall, findings suggest that psychosocial interventions may be an important adjunct to medical interventions for BS patients[2 26]. Collectively, studies provide evidence that BS patients who received post-operative psychosocial interventions, experienced improvements in health-related outcomes (i.e., reduced depression and anxiety; greater weight loss; reduced maladaptive eating behaviour), when compared to baseline measures and/or UC. Interventions were delivered face-to-face in clinics, online and via the telephone. Though clinic attendance was good, the inclusion of telephone[63] and/or internet-based[11 26] interventions was novel and effective. Psychosocial interventions delivered post-operatively have typically relied on face-to-face contact; travel or mobility may be challenges impacting attendance and retention[63]. Interventions delivered remotely improve reach and are more convenient[11]. Telephone delivered interventions may offer a convenient alternative to face-to-face interventions[63] for BS patients and have demonstrated efficacy in treating a range of populations (e.g., depression and anxiety[64]; binge eating[65]). Initial development costs of internet-based interventions can be high[30], however acceptability ratings in this review were high[11 30], showing that electronic tools improve compliance with self-monitoring compared to paper use[66 67].

There was weak to moderate evidence supporting interventions which included: nutrition and lifestyle-modification[7 27]; psychoeducation programmes[30]; ACT[11 26]; CBT[28 29 39], and mindfulness-based practices[10 15]. Psychoeducation programmes that included nutrition and lifestyle guidance addressed the physiological requirements of life after surgery[27 30], whereas CBT (challenging negative thoughts/feelings [49]), ACT (focus on pursuing valued actions[25]) and mindfulness-based approaches[10 15] addressed psychological needs. It may be that individuals develop greater psychological flexibility[26], through experiential interventions (e.g., mindfulness, defusion), by learning to be less reactive to conditioned propensities[13 30]. Used singularly or in combination, these techniques improved post-operative outcomes for BS patients, though ABTs appeared to be more effective[11 26 30]. In this context, the evidence suggests that BS patients may benefit most from interdisciplinary input (i.e., psychosocial intervention including psychoeducation with nutrition and lifestyle support)[13 68] using a stepped-care approach[4 29 30 42].

5. Limitations of review

The first author identified study eligibility. Study quality was assessed by the first three authors. This narrative review synthesizes the evidence presented in the selected studies for the purpose of establishing intervention efficacy and study quality. It is recognised that data interpretation and determination of reliable conclusions is challenging; as such the value of the narrative synthesis may be limited[35]. However, it may prove useful for scoping the landscape regarding psychosocial interventions for the BS population, thus informing further enquiry[35]. The inherent methodological shortcomings of the selected studies, were identified earlier.

6. Conclusion

The strength of the evidence is currently limited by the quality and small number of studies found. Preliminary findings suggest that post-operative psychosocial interventions which support psychological wellbeing and weight loss in BS patients should be:

- interdisciplinary
- delivered 1-year post-operative
- flexible to deliver
- cost-effective

7. Recommendations for future research

Currently, post-operative success is equated to total weight loss, however future research should consider the impact of post-operative psychological interventions on weight-related outcomes[39]. Post-operative psychological support, exploring issues related to dietary control, eating behaviour and self-esteem require further studies to assess efficacy[8]. Psychological flexibility, which Weineland and colleagues[26] argue may be the mechanism underpinning change, warrants further investigation. Tighter control over comparison groups is important for establishing interventions' true impact, with standardisation post-operative delivery times to assess optimal intervention delivery/uptake[25.] Longer monitoring of post-operative BS patients is needed to identify and address risk behaviour[30]. Finally, the acceptability and efficacy of remotely delivered interventions, including larger samples, which explore how intervention components deliver success are needed (i.e., self-monitoring versus engagement with professional)[11 26 30].

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Table 2. Description of selected studies providing post-operative psychosocial interventions supporting psychological well-being for bariatric patients

Study Authors	Title	Methodology and analysis	Who delivered and where	Intervention delivery	Sample characteristics	Outcome measures	Findings	EPHPP score
Wild et al (2017)	Sustained effects of a psycho-educational group intervention following bariatric surgery: follow-up of a randomised controlled BaSE study	RCT Medical and Psychological Assessments for baseline study May 2009 to November 2012: T0 (pre-op); T1 (1-month post-operative); T2 (3-months post-operative); T3 (6-months post-operative); T4 (1-year post-operative). **Present study** at T5 (January 2013 to April 2015): 37.9 months (SD	Psychotherapist led Inter-disciplinary team (psychologists, nutritionists, sports medicine experts, 2 medical doctors) at the University Hospitals of Heidelberg and Tubingen and Hospital Sachsenhausen (Frankfurt), Germany	Intervention (n=39) and control group (n=35). Intervention group: 1-year group program, 5 face-to-face group sessions (6 patients, 90 minutes each), followed by 6 video conferencing webcam sessions (3 patients, 50-mins each); then 3 face-to-face groups sessions. Sessions included	Baseline randomised study (n=117) **Present study** at T5 (n=74) T5 retention 63.2% Post-operative bariatric patients (sleeve, bypass); adults 18 – 65, mean age 41.55; Severe obesity BMI > 40 kg/m2 or BMI > 35kg/m2 with somatic co-morbidities. Exclusion: severe mental health problems	BMI (kg/m2) Weight loss (digital scale) Self-efficacy (GSE) Depression severity (PHQ – 9) Health related quality of life (SF-36) Eating disorder psychopathology (EDE)	sustained effects in SE scores and depression severity, which could lead to better long-term weight maintenance Mean weight loss 43kg (SD 15.5kg) at T5 (mean BMI 35.1 kg/m2). Excess weight loss 60.4% (d=.10). First year post-op intervention group: weight loss; reduction of psychosocial burden.	2 - Moderate

		8.2 months) post-op (11-49 months after the completion of the intervention program). Intention to treat Mixed model for repeated measures (MMRM) *(i.e. baseline and missing data at T5 used), Pearson Correlation,* Sensitivity Analysis		guidance on: nutrition; coping; body image; exercise; mindfulness; and self-monitoring. Control group: conventional post-operative visits (weight, clinical examination and eating behaviour monitoring at 1,3, 6 and 12-months post-op.	(psychosis; suicidal ideation); language or cognitive disability, no internet.		T5 (both groups): observed weight regain; deterioration of psychosocial aspects. T5: intervention group showed significantly lower depression (p = .03, d=-.52) and higher self-efficacy (p = .03, d=.60) compared to control but groups did not differ regarding weight loss and QoL.	
Beaulac and Sandre (2015)	The impact of a CBT psycho-therapy group on post-operative bariatric patients	Pilot cohort analytic intervention study Longitudinal	Clinic psychologists, psychology resident at the weight management	Two groups: (n=9) and (n=8) Two consecutive, eight-week CBT-based psychotherapy	(n=17) Post-operative bariatric patients; 2 male and 15 females;	Emotional Overeating Questionnaire (EOQ)	Short-term group CBT psychotherapy led to significant benefits in psychological	3 - Weak

	pre-post non-randomized design with a 3-month follow-up Paired samples t-tests, comparing baseline to post-treatment periods, then comparing baseline to follow-up	clinic, Ottawa Hospital, Canada	and psychoeducational group intervention. Outcome measures completed at week 1 and week 8. Measures were mailed (postage paid) to participants, 3-months post group completion. Session 1 - introduction to the CBT models Session 2 - coping styles Session 3 - relationship between emotions and food Session 4 - strategies aimed	adults 28-62, mean age 48 (SD = 9.5); 70.6% maternal language English; 70.6% graduated from college or university; 53% were married or common-law; 35.3 % were working full-time; 23.5% were retired; 17.6% on disability leave; 23.5 % on social assistance. Exclusion: severe mental health problems (psychosis; suicidal ideation.	Obesity Adjustment Survey (OAS) Kessler Psychological Distress Scale (K10) The Experiences in Close Relationship Scale (Short-Form; ECR-S) The Outcome Questionnaire-45 (OQ-45) The Client Satisfaction Questionnaire (CSQ8)	well-being in post-operative BS patients. Three of the six paired samples t-tests were statistically significant with large effect sizes. Statistically significant changes from baseline to post-treatment found on the total score for the: OQ-45, K10, OAS (also observed at 3-month follow-up). Participants experienced reduced psychological distress (K10; $t(11) = 6.603$, $p < 0.000$), reduced perceived

		at reducing emotional eating behavior Session 5 - strategies for challenging and reframing cognitive distortions Session 6 - body image Session 7 - relationships and communication styles Session 8 - concepts of relapse prevention	difficulties (OQ-45; t(11) = 3.166, p < 0.009), and improved weight-related adjustment (OAS; t(11) = 2.780, p < 0.018), which remained significantly different when comparing baseline to 3-months follow-up. Large effect sizes were found for improvements at follow-up in the OQ-45 (d= 0.95), K10 (d= 1.99), OAS (d= 0.83), and EOQ (d= 0.53). Small improvements for the ECR (d= 0.31 for anxiety; d=

							0.21 for avoidance).	
Weineland et al (2012)	Psychological flexibility and the gains of acceptance-based treatment for post-bariatric surgery: six-month follow-up and a test of the underlying model	RCT Intention to treat Time by treatment condition interaction Mixed model for repeated measures (MMRM), effect size, mediation analysis	Bariatric team in specialist BS clinic, Sweden	ACT (n=12) and TAU (treatment as usual) (n= 17) ACT: two 90-minute face-to-face clinic sessions emphasising individual behavioural analysis of experiential avoidance (i.e. emotional eating); followed by six 30-min telephone support sessions and internet-based self-help ACT modules exploring: (1) values, (2) acceptance, (3) mindfulness, (4)	Baseline study (n=39) Present follow-up study (n=29) Follow-up retention 74.3% Post-operative bariatric patients; adults 25-59, mean age 43.08; all employed; participants reported an average of 23 years duration of obesity, and 20 years of failed weight loss attempts prior to surgery. Exclusion: severe	Eating disordered behaviour EDE-Q Subjective binge eating questionnaire SBEQ Body shape questionnaire BSQ World Health Org Quality of Life (WHOQOL-Brief) Acceptance and action for weight (AAQ-W) Participants estimated weekly application use and whether they would recommend the package.	The ACT group shows significant improvements as compared with (TAU) at a 6-month follow-up and shows that the mechanism of change may be psychological flexibility. ACT led to gains in QoL (t (59.31) = -2.37, p = .021, d = 0.88) and improvements in body dissatisfaction (t (58.65) = 2.09, p = .041, d = 0.77), as compared with TAU. ACT (t (59.23) = -3.12, p = .003, d = 0.86)	2 - Moderate

				defusion and self as context, (5) committed action and (6) review. Intervention included psycho-education texts, mindfulness audio files, written exercises, and audio-visual animations. TAU: received standard follow-up sessions with the bariatric surgery team (i.e. dietary guidelines, followed-up telephone support as required).	depression and suicidal attempts.		and TAU (t (57.94] = -2.34, p = .023, d = 0.55) showed improvements in eating disordered behaviours. The role of enhanced psychological flexibility in the changes observed in eating disordered behaviour, body dissatisfaction and QoL, is supported by a series of multiple mediator tests.	
Nijamkin et al (2013)	Comprehensive behavioural-motivation-al nutrition	RCT Intention to treat	Bariatric surgeon, dietitian and psychologist in a specialist	Comprehensive (n=72) and standard care (n=72).	(n=144) Retention 85.4%	Body weight was measured using a digital scale.	Participants receiving the comprehensive behavioural-	2 - Moderate

education improves depressive symptoms following bariatric surgery: a randomized controlled trial of obese Hispanic Americans	Independent samples t-tests, regression analysis	laparoscopic institution, USA	Phase 1 clinical trial (preoperative to 6-months after surgery), all participants received standard care. During Phase 2 (6 to 12-months post-operative), participants were randomly assigned to receive either standard care (n=72) or comprehensive support (n=72). Comprehensive group participants received 6 educational sessions focused on behavior change	Post-operative bariatric patients; Hispanic American adults, primarily women (83%); mean age was 44.5 plus/minus 13.5 years; 49% (n = 71) were Cuban born; 46% were married (n = 66); 57% were employed (n = 82); 52% were bilingual (n = 75); participants were well educated (13.7 plus/minus 2.7 mean years of education). Exclusion: non-ambulatory; pregnancy; BS post-operative complications and	A registered dietitian collected nutritional data using 3, 24-hour dietary recalls completed at each assessment visit. Depression: Beck's Depression Inventory (BDI-II) questionnaire Physical activity: self-reported questionnaire based on the Short Questionnaire to Assess Health Enhancing Physical Activity	motivational nutrition-education intervention scored significantly lower on Beck's Depression Inventory questionnaire, compared to those receiving standard care ($p < .001$). Participants with depressive symptoms at randomization: 24% of participants who received the comprehensive intervention reported no depressive symptoms at 12

				strategies and motivation with nutrition counselling.	medical conditions like heart or kidney disease		months after surgery, compared with 6% of those who received standard care ($p < .001$). Participants' depressive mood improvement was significantly and positively associated with attendance at educational sessions and excess weight loss ($p < .001$).	
Himes at al (2015)	Stop Regain: A pilot psycho-logical intervention for bariatric patients experien-cing weight regain	Pilot cohort intervention study Pre-post design Intention to treat	Specialist psychiatric and psychological team at a large academic medical centre, USA	A 6-week group treatment intervention, using a combination of CBT and DBT strategies, lasting 1 hour per week.	(n=28) Retention 67.9% Post-operative gastric bypass patients; mean age 53±9; 93% female; BMI mean of 35.6;	Baseline: SCID I 15-item Distress Tolerance Scale (DTS) The Eating Disorder Diagnostic Scale (EDDS)	Level of depressive symptoms improved for treatment completers ($p \leq .01$). Food records indicated that	3 - Weak

	Repeated measures ANOVA	Early treatment comprised of orienting patients to factors in weight regain, increasing behavioural adherence and accountability through self-monitoring, stress management, diet skills, and managing emotional dysregulation, which can influence disordered eating patterns and other unhealthy practices (i.e. substance misuse). Patients were then introduced to	average weight regain of 37 % of initial weight lost (17 kg); mean time pot-operative 4 years; Caucasian. Exclusion: moderate to severe depression; uncontrolled bipolar disorder; substance dependence and revisional BS	Beck Depression Inventory II (BDI-II) The Eating Disorder Examination-Questionnaire (EDEQ) Questions were also tailored to the bariatric population. Grazing was calculated for the study by reviewing food records.	grazing patterns decreased ($p \leq .01$) and subjective binge eating episodes decreased ($p \leq 0.03$). Weight decreased during the intervention by an average of 1.6±2.38 kg ($p \leq .01$).

				a stepped care approach to weight maintenance.				
Chako et al (2016)	A mindfulness-based intervention to control weight after bariatric surgery: preliminary results from a randomized controlled pilot trial	Pilot RCT Intention to treat Wilcoxon rank sum, t-test, linear and mixed model and sensitivity analysis	Dietician, qualified mindfulness instructor at Beth Israel Deaconess Medical Center, Boston, MA, USA	Mindfulness (MBI) (n=9) and standard care (n=9). MBI: once weekly classes for ten weeks; sessions lasted 90-minutes starting with formal mindfulness practice (e.g. sitting meditation, body scan, walking meditation), followed by group sharing on the week's experience, ending with a teaching session	(n=18) (n=7) MBI completers (n=9) standard care completers Retention 88.8% Post-operative bariatric patients; underwent surgery 1–5 years prior to the start of the intervention; adults 18–65, mean age 53.95; reported < 5 lbs weight loss in the past 3 months. Exclusion: severe psychiatric and personality	BMI (kg/m2) The Three Factor Eating Questionnaire Revised-18 (TFEQ-R18) The Binge Eating Scale (BES) Weight Efficacy Lifestyle Questionnaire (WEL) Physical activity level: tracked using an adapted version of the 7-day physical activity recall and calculated total energy expenditure (kcal/kg) based	Participants reported high satisfaction and overall benefit of MBI. MBI was effective in reducing emotional eating at 6 months (−4.9 ± 13.7 in mindfulness vs. 6.2 ± 28.4 in standard, between-group difference, p = .03) but not weight reduction. Significant increase in HbA1C (0.34 ± 0.38 vs. −0.06 ± 0.31, p = 0.03).	2 - Moderate

	covering a behavioural concept. A half-day retreat (4 hours) of silent meditation was held mid-way through the course. Participants were asked to meditate at home at least six days/week. Audio recordings of guided meditations were provided. Meditation lengths increased each week and were taught in a similar style as in MBSR. Standard care: participants received a 1-hour	disorders; substance misuse; 6-months prior meditation experience.	on metabolic equivalents (METs) QOL: Medical Outcomes Study Short-Form-36 (SF-36) questionnaire Impact of weight on QOL: (IWQOL-Lite) Depression Scale (CES-D) Perceived Stress Scale COPE Biochemical Assays	Though objective measures suggested increased symptoms of depression and perceived stress, participants reported improved eating behaviour, reduced stress reactivity wanted more mindfulness-based support.

				individualized counselling session with a registered dietician at BIDMC. Participants spoke to the dietician about their managing their weight. The dietician provided guidance on nutrition and lifestyle strategies tailored to post-operative patients. Change scores were calculated for all outcomes at baseline, 12-weeks and 6-months.				
Papalazarou et al (2010)	Lifestyle intervention	Cohort analytic intervention study	Dietician in the dietetics	Lifestyle intervention (LS)	(n=30)	BMI (kg/m2)	The LS group showed	2 - Moderate

favourably affects weight loss and maintenance following obesity surgery	Descriptive statistics presented as mean ± s.e.m. One-way ANOVA, Kruskal–Wallis test, χ2-test, Levene's test, Repeated measures ANOVA, Friedman's test, Bonferroni post hoc test, multiple regression analyses	department of the Evagelismos general hospital in Athens, Greece	and usual care (UC). Usual care: patients visited the dietician once weekly for the first 3-months post-operatively; then every other week for the next 3-months; monthly for the following 6-months; every 3-months for the second post-operative year; then every 6-months for the third postoperative year (30 sessions in the 3 years). Post-operative dietary guidelines and general	Post-operative bariatric patients; female patients (mean BMI: 49.5 ± 7.5 kg/m2; age range 21–45, mean age 33.05; history of multiple, failed, previous attempts for weight loss; underwent Vertical banded gastroplasty (Mason technique) at "Evagelismos" general hospital from January 2005 to January 2006. Exclusion: absence of psychiatric illness; male gender.	Dietary intake and meal patterns: food diaries Physical activity: self-reported questionnaire (Harokopio Physical Activity Questionnaire) Eating behavior: the Dutch Eating Behavior Questionnaire (DEBQ)	significant improvements in eating behaviour and weight loss, as compared to UC. At all postoperative time points, the LS group scored significantly better on eating behaviour in the Restraint Eating and External Eating scale and total Dutch Eating Behavior Questionnaire (DEBQ), ($p < .05$). Weight was significantly lower in the LS group after 12 months (84.4 ± 3.9 kg vs.

	information on adopting a healthier lifestyle, was provided during these assessment sessions. LS group: patients attended additional 40-min individualized sessions with the dietitian during these assessment visits. A patient-centered collaborative approach was used, along with behaviour modification techniques, such as goal setting, stimulus control, self-monitoring,	98.4 ± 4.4 kg, p < .05), 24 months (83.0 ± 3.3 vs. 101.9 ± 5.3 kg, p < .05), and 36 months following surgery (84.2 ± 3.3 vs. 102.5 ± 3.5 kg, p < .05). Repeated measures ANOVA showed significant differences between the two groups overall and at specific time points for the PAL and TV viewing (p < .05).

				self-evaluation, reinforcement and relapse control.				
Sockalingam et al (2016)	A pilot study on telephone cognitive behavioural therapy for patients six-months post-bariatric surgery	Uncontrolled single-arm prospective cohort intervention pilot study Pre-post design Mean difference scores, independent t-tests, chi-square, Cohen's d effect size	Master's-level psychologists supervised by two doctoral level registered clinical psychologists, delivered the Tele-CBT, in Canada	Participants received six sessions of Tele-CBT scheduled weekly, lasting around 55 minutes. The focus of the Tele-CBT intervention was overeating and obesity. Sessions included an introduction to the CBT model of obesity, meal scheduling and food records, scheduling pleasurable activities, problem solving strategies	(n=19) Retention 73.7% Post-operative bariatric patients; mean age 46.21±9.03 years; 12 were female; ten patients were in a relationship; participants underwent gastric bypass surgery. Exclusion: ineligibility for BS; lack of computer access; language barrier; significant psychiatric or medical illness	BMI (kg/m2) Binge eating (BES) Emotional eating (EES) Depressive symptoms (PHQ-9) Anxiety symptoms (GAD-7)	Tele-CBT improved post-operative symptoms of psychopathology. Tele-CBT resulted in significant reductions in mean difference scores on BES, EES-Total, EES-Anxiety, EES-Anger, PHQ9, and GAD7. Tele-CBT patients experienced a mean weight loss of 8.62 ± 15.02 kg between 6-months post-	3 - Weak

		to reduce vulnerability, managing difficult eating scenarios and challenging negative thoughts.	operative (pre-Tele-CBT) and 12-months post-operative. Mean difference scores for BES (mean difference = −12.64, 95 % CI [−15.88, −9.40], d = 8.69), EES-total (mean difference = −17.10, 95 % CI [−30.37, −3.83], d = 2.95), EES-anxiety (mean difference = −4.82, 95 % CI [−9.28, −0.35], d = 2.40), and EES-Anger (mean difference = −8.45, 95 % CI [−13.85, −3.06], d = 3.49) scores were significantly

							reduced following Tele-CBT. Participants also experienced significant decreases in PHQ9 (mean difference = −4.09, 95 % CI [−7.23, −0.95], d = 2.90) and GAD7 (mean difference = −2.64, 95 % CI [−4.23, −1.04], d = 3.68) scores after Tele-CBT.	
Bradley et al (2017)	Project HELP: a remotely delivered behavioural intervention for weight regain after bariatric surgery	Pilot cohort intervention study Pre-post design Intent to treat All variables are reported as mean	Program coaches were advanced graduate students with at least 1-year of experience delivering acceptance-based therapies	The intervention (Project HELP): was delivered via online modules. 10 weekly sessions were developed using an e-learning software suite	(n=16) Retention 70% Post-operative bariatric patients; 18–70 years old, mean age 50.7; minimum 1.5 years post-	BMI (kg/m2) Caloric intake: online self-monitoring (MyFitnessPal) Loss of control eating: (EDE-Q) Disinhibition, restraint, and	Significant improvements in weight loss and maintenance, eating behavior and acceptance-based variables. High mean rating (4.7 out of 5.0) of	3 - Weak

	± standard deviation or frequency and percentages, T tests, completer analyses	(ABTs) for weight control, online and via the telephone, in the USA	(i.e., Articulate); hosted on Coursesites (a popular e-learning platform). Participants completed a brief induction tutorial about the technical components of the online program. Assessments time points included: (1) baseline (within 2 weeks prior to starting the intervention), (2) mid-treatment (after completing the fifth online module), (3) post-treatment (at the	operative; ≥10 % weight regain of maximum weight loss or 5 % of their minimum weight post-surgery, and weight regain lasting for at least 3 months prior to enrolment. Exclusion: participation in weight loss programme, pregnancy; medical condition affecting weight; psychiatric illness; suicidality.	reactivity to internal and external cues: The Eating Inventory Emotional Eating: (EES) Grazing behavior: self-report questionnaire Food cravings: (FCQ-T) Physical Activity: The Paffenbarger Physical Activity Recall Acceptance-Based Process Variables: The Acceptance subscale of the Philadelphia Mindfulness Scale (PHLMS) Food Related	program satisfaction among study completers. Treatment completers demonstrated significant weight loss from pre- to post-treatment (5.1 ± 5.5 %; 5.9 ± 6.5 kg, t(10) = 3.02, p = .01). Intent-to-treat analyses also revealed significant weight loss pre- to post-intervention (3.9 ± 5.0 %; 4.4 ± 5.8 kg, t(15) = 3.05, p = .01). On average, weight regain was reversed with a mean weight loss

		completion of the final module), and (4) follow-up (3 months following completion of the final module). Participants were compensated $15 for completing the mid-treatment assessment and $25 for the post-treatment and 3-month follow-up assessments. All assessments were conducted remotely via online questionnaires. Module content (ABT strategies like acceptance, defusion and mindfulness; portion control	Acceptance and Action: (FAAQ) Defusion: Drexel Defusion Physical Activity Acceptance: (PAAQ)	of 5.1 ± 5.5 % throughout the intervention, maintained with an additional average weight loss of 0.6 ± 2.7 % from post-treatment to follow-up. Total average weight loss from pre-treatment to 3-month follow-up was 5.7 ± 6.1 %. Problematic grazing decreased from 36.4 to 9.1 % from pre- to post-treatment. EDE-Q revealed that average frequency of loss of control eating episodes

	and self-control; psychoeducation) included material using text, images, audio, and video to convey session content. Included were interactive exercises and quizzes, examples of other patients utilizing ABT skills and directed assignments to be completed weekly (i.e., Skill Builders). Participants were asked to record their food intake daily using MyFitnessPal and to record their weight and	decreased from 4.3 times to 0.9 times within the previous 4 weeks (M = 3.36, SD = 6.04, t(10) = 1.85, p = .09). Furthermore, loss of control eating episodes decreased from 63.6 to 27.3 % pre- to post-treatment. Residualized changes in hypothesized mediators strongly correlated with residualized changes in weight including: defusion (r = −0.58, p = 0.06), disinhibition (r =

		average daily calories in an online spreadsheet weekly, producing a graph to show progress.	0.55, p = 0.08), reactivity to internal cues (r = 0.71, p = 0.02), eating in response to depression (r = 0.63, p = 0.04), food cravings (r = 0.54, p = 0.09), and food-related acceptance (r = −0.50, p = 0.12). Significant changes in self-reported use of acceptance-based skills: defusion (p = .02, d= .86); cognitive restraint (p< .01, d= 1.84), increased food-related activity (p< .01, d=1.47);

							physical activity related activity (p= .05, d=.69); decreases in anxiety associated with emotional eating (p= .02; d= 0.64).	
Leahey et al (2008)	A cognitive-behavioural mindfulness group therapy intervention for the treatment of binge eating in bariatric surgery patients	Cohort intervention study Pre- post design Mean values, effect sizes	Two clinical psychology doctoral candidates in their fourth year of training, supervised by a licensed psychologist, in a hospital setting, USA	10-week cognitive-behavioural mindfulness-based group intervention, designed to address the specific needs of bariatric surgery patients and to reduce binge eating. Mindfulness-based practices (e.g., increase awareness of food consumption	(n=7) Post-operative bariatric patients; 6 females and 1 male; 5 band; 2 gastric bypass; adults 49 – 64, mean age 54; all were employed or retired; 1 group member was African American; the others were Caucasian; 5 were married or	Eating disorder symptomatology. Eating Disorders Examination Questionnaire EDE-Q (28 days before) The Emotional Eating Scale EES The Eating Self-Efficacy Scale ESES Depression scale - The BDI-II The Difficulties in Emotion Regulation Scale (DERS)	Improvement in binge eating symptoms, depression, emotion regulation and increased motivation to change maladaptive eating behaviour we observed post-treatment. Eating disturbances: all reported reduction in loss of control (d =	3 - Weak

	with associated cues; increase self-acceptance and adaptive coping skills) were added to traditional cognitive-behavioural techniques (e.g., addressing dysfunctional cognitions regarding food and eating; developing alternative coping strategies; improving adherence). Stage 1: psychoeducation, enhance motivation, self-monitoring food intake, and	partnered; 2 had never been married; 6/7 had lost weight following surgery; BMIs ranging from 35.0 to 52.4 at the start of the intervention; all patients had significant medical comorbidities, with the most prevalent being hypertension, diabetes, and hyperlipidaemia; 6/7 were depressed. Exclusion: non-bariatric patients; pre-operative bariatric patients.	Motivation for change - The Stages of Change Readiness and Treatment Eagerness Scale SOCRATES Post-treatment group effectiveness questionnaire. A questionnaire was designed to assess how useful the group was at helping members	1.47); most reported a reduction in guilt (d = 1.26), eating concerns (d = 0.82) and in weight concerns (d = 1.20). The group's Restraint score increased slightly (d = 0.11). Most had an increase in shape concerns (d = 0.78). Perceived eating self efficacy increased for all participants (d = 1.73). Depression: nearly all reported a reduction in depression (d = 1.50). Overall emotion regulation

	develop insight into eating triggers and patterns. Stage 2: group members work to modify their behavior, consistent with post-operative recommendations (i.e. eating 5 to 6 small meals daily, portion and trigger control, not drinking while eating, consuming appropriate amounts of protein and carbohydrate). Stage 3: address problematic thought processes,	difficulties were reduced from (d = 0.57). Motivation for change: nearly all increased activity in changing their problematic eating behaviour (d = 1.06). Weight: the deviation from expected weight loss was reduced from 12.29 to 6.43 pounds. All reported that the intervention was effective.

		improve coping skills and increase mindfulness practices. Participants continue to monitor their food intake, schedule meals, minimize external triggers, and engaging in mindful eating. Stage 4: final stage of treatment focuses on termination, by solidifying newly learned behavior, mindfulness techniques, and emotion-regulation strategies.

Effect sizes calculated according to Cohen's d formula: d= 0.2 (small effect size); d= 0.5 (medium effect size); d= 0.8 (large effect size)

Data extraction sheet

Person extracting data:

Date(s) of extraction:

Report title:

Author:

Author correspondence:

Type of publication:

Country of origin:

Funding:

Conflict of interest:

STUDY TYPE:

- **Study characteristics**

Background:
Aim/objectives of the study
Study design / method *(type of analysis used in study, e.g. intention to treat, per protocol)*
Any particular theoretical / conceptual models used
Target population
Sampling *(i.e. recruitment process)*
Characteristics of participants (*i.e. age, gender, race, co-morbidities, inclusion and exclusion criteria, informed consent)*
Number enrolled *(baseline)*
Number completing/retained
Study duration *(i.e. start / end date)*
Ethical approval

- **Intervention and setting**

Setting
Description of the intervention(s)
Control condition
Who delivered the intervention?
Blinding

- **Results**

Outcome identified
Outcome measures used and when
Details of key findings
Number included in analysis
Details of other outcomes/findings/discussion points regarding practice and further research
Strengths and limitations/bias *(selection, performance, detection, reporting)* of study
Other issues – conclusions of authors
Issues with conclusions of authors

Reviewer's comments:

QUALITY ASSESSMENT TOOL FOR QUANTITATIVE STUDIES

COMPONENT RATINGS

A) SELECTION BIAS

(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?

1 Very likely

2 Somewhat likely

3 Not likely

4 Can't tell

(Q2) What percentage of selected individuals agreed to participate?

1 80 - 100% agreement

2 60 – 79% agreement

3 less than 60% agreement

4 Not applicable

5 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

B) STUDY DESIGN

Indicate the study design

1 Randomized controlled trial

2 Controlled clinical trial

3 Cohort analytic (two group pre + post)

4 Case-control

5 Cohort (one group pre + post (before and after))

6 Interrupted time series

7 Other specify _____

8 Can't tell

Was the study described as randomized? If NO, go to Component C.

No Yes

If Yes, was the method of randomization described? (See dictionary)

No Yes

If Yes, was the method appropriate? (See dictionary)

No Yes

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

C) CONFOUNDERS

(Q1) Were there important differences between groups prior to the intervention?

1 Yes

2 No

3 Can't tell

The following are examples of confounders:

1 Race

2 Sex

3 Marital status/family

4 Age

5 SES (income or class)

6 Education

7 Health status

8 Pre-intervention score on outcome measure

(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (e.g. stratification, matching) or analysis)?

1 80 – 100% (most)

2 60 – 79% (some)

3 Less than 60% (few or none)

4 Can't Tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

D) BLINDING

(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?

1 Yes

2 No

3 Can't tell

(Q2) Were the study participants aware of the research question?

1 Yes

2 No

3 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

E) DATA COLLECTION METHODS

(Q1) Were data collection tools shown to be valid?

1 Yes

2 No

3 Can't tell

(Q2) Were data collection tools shown to be reliable?

1 Yes

2 No

3 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

F) WITHDRAWALS AND DROP-OUTS

(Q1) Were withdrawals and drop-outs reported in terms of numbers and/or reasons per group?

1 Yes

2 No

3 Can't tell

4 Not Applicable (i.e. one-time surveys or interviews)

(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest).

1 80 -100%

2 60 - 79%

3 less than 60%

4 Can't tell

5 Not Applicable (i.e. Retrospective case-control)

RATE THIS SECTION	STRONG	MODERATE	WEAK	
See dictionary	1	2	3	Not Applicable

G) INTERVENTION INTEGRITY

(Q1) What percentage of participants received the allocated intervention or exposure of interest?

1 80 -100%

2 60 - 79%

3 less than 60%

4 Can't tell

(Q2) Was the consistency of the intervention measured?

1 Yes

2 No

3 Can't tell

(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?

4 Yes

5 No

6 Can't tell

H) ANALYSES

(Q1) Indicate the unit of allocation (circle one) community organization/institution practice/office individual

(Q2) Indicate the unit of analysis (circle one) community organization/institution practice/office individual

(Q3) Are the statistical methods appropriate for the study design?

1 Yes

2 No

3 Can't tell

(Q4) Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than the actual intervention received?

1 Yes

2 No

3 Can't tell

GLOBAL RATING

COMPONENT RATINGS

Please transcribe the information from the grey boxes on pages 1-4 onto this page. See dictionary on how to rate this section.

A	**SELECTION BIAS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
B	**STUDY DESIGN**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
C	**CONFOUNDERS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
D	**BLINDING**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
E	**DATA COLLECTION METHOD**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
F	**WITHDRAWALS AND DROPOUTS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	Not Applicable

GLOBAL RATING FOR THIS PAPER (circle one):

1	STRONG	(no WEAK ratings)
2	MODERATE	(one WEAK rating)
3	WEAK	(two or more WEAK ratings)

With both reviewers discussing the ratings:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

No Yes

If yes, indicate the reason for the discrepancy

1 Oversight

2 Differences in interpretation of criteria

3 Differences in interpretation of study

Final decision of both reviewers (circle one):

1 STRONG

2 MODERATE

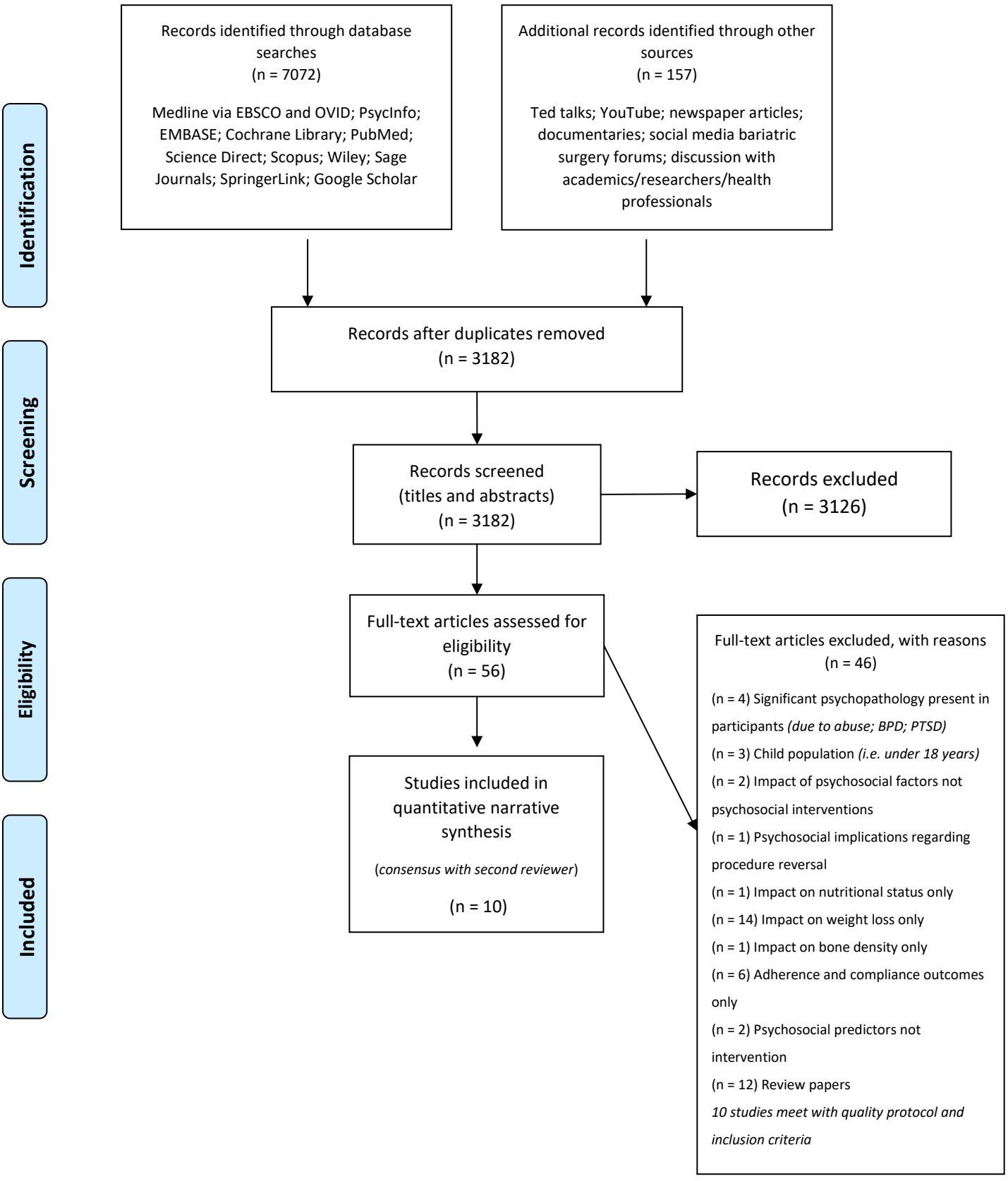
3 WEAK

Figure 1. Search terms

Psychosocial interventions AND gastric bypass
Psychological interventions AND post-gastric bypass
Psychosocial interventions AND post-gastric bypass AND psychological wellbeing
Psychological interventions AND post-gastric bypass
Post-gastric bypass AND psychosocial interventions
Psychotherapeutic interventions AND post-gastric bypass
CBT interventions AND post-gastric bypass
Mindfulness interventions AND post-gastric bypass
Psychoeducation AND post-gastric bypass
Support groups AND post-gastric bypass
Effective psychosocial interventions post-gastric bypass
Psychological wellbeing AND post-gastric bypass
Psychotherapy AND post-gastric bypass
Group therapy AND post-gastric bypass

Figure 2. PRISMA 2009 Flow Diagram

A systematic review of psychosocial interventions that support psychological well-being in post-operative bariatric surgery patients



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No Yes

If Yes, was the method appropriate? (See dictionary)

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7 Health status

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See dictionary	1	2	3

F) WITHDRAWALS AND DROP-OUTS

(Q1) Were withdrawals and drop-outs reported in terms of numbers and/or reasons per group?

1 Yes

2 No

3 Can't tell

4 Not Applicable (i.e. one-time surveys or interviews)

(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest).

1 80 -100%

2 60 - 79%

3 less than 60%

4 Can't tell

5 Not Applicable (i.e. Retrospective case-control)

RATE THIS SECTION	STRONG	MODERATE	WEAK	
See dictionary	1	2	3	Not Applicable

G) INTERVENTION INTEGRITY

(Q1) What percentage of participants received the allocated intervention or exposure of interest?

1 80 -100%

2 60 - 79%

3 less than 60%

4 Can't tell

(Q2) Was the consistency of the intervention measured?

1 Yes

2 No

3 Can't tell

(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?

4 Yes

5 No

6 Can't tell

H) ANALYSES

(Q1) Indicate the unit of allocation (circle one) community organization/institution practice/office individual

(Q2) Indicate the unit of analysis (circle one) community organization/institution practice/office individual

(Q3) Are the statistical methods appropriate for the study design?

1 Yes

2 No

3 Can't tell

(Q4) Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than the actual intervention received?

1 Yes

2 No

3 Can't tell

GLOBAL RATING

COMPONENT RATINGS

Please transcribe the information from the grey boxes on pages 1-4 onto this page. See dictionary on how to rate this section.

A	**SELECTION BIAS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
B	**STUDY DESIGN**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
C	**CONFOUNDERS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
D	**BLINDING**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
E	**DATA COLLECTION METHOD**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
F	**WITHDRAWALS AND DROPOUTS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	Not Applicable

GLOBAL RATING FOR THIS PAPER (circle one):

1	STRONG	(no WEAK ratings)
2	MODERATE	(one WEAK rating)
3	WEAK	(two or more WEAK ratings)

With both reviewers discussing the ratings:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

No Yes

If yes, indicate the reason for the discrepancy

1 Oversight

2 Differences in interpretation of criteria

3 Differences in interpretation of study

Final decision of both reviewers (circle one):

1 STRONG

2 MODERATE

3 WEAK

Table 1. Description of selected studies providing post-operative psychosocial interventions supporting psychological well-being for bariatric patients

Study Authors	Title	Methodology and analysis	Who delivered and where	Intervention delivery	Sample characteristics	Outcome measures	Findings	EPHPP score
Wild et al (2017)	Sustained effects of a psycho-educational group intervention following bariatric surgery: follow-up of a randomised controlled BaSE study	RCT Medical and Psychological Assessments for baseline study May 2009 to November 2012: T0 (pre-op); T1 (1-month post-operative); T2 (3-months post-operative); T3 (6-months post-operative); T4 (1-year post-operative). **Present study** at T5 (January 2013 to April 2015): 37.9 months (SD	Psychotherapist led Inter-disciplinary team (psychologists, nutritionists, sports medicine experts, 2 medical doctors) at the University Hospitals of Heidelberg and Tubingen and Hospital Sachsenhausen (Frankfurt), Germany	Intervention (n=39) and control group (n=35). Intervention group: 1-year group program, 5 face-to-face group sessions (6 patients, 90 minutes each), followed by 6 video conferencing webcam sessions (3 patients, 50-mins each); then 3 face-to-face groups sessions. Sessions included	Baseline randomised study (n=117) **Present study** at T5 (n=74) T5 retention 63.2% Post-operative bariatric patients (sleeve, bypass); adults 18 – 65, mean age 41.55; Severe obesity BMI > 40 kg/m2 or BMI > 35kg/m2 with somatic co-morbidities. Exclusion: severe mental health problems	BMI (kg/m2) Weight loss (digital scale) Self-efficacy (GSE) Depression severity (PHQ – 9) Health related quality of life (SF-36) Eating disorder psychopathology (EDE)	sustained effects in SE scores and depression severity, which could lead to better long-term weight maintenance Mean weight loss 43kg (SD 15.5kg) at T5 (mean BMI 35.1 kg/m2). Excess weight loss 60.4% (d=.10). First year post-op intervention group: weight loss; reduction of psychosocial burden.	2 - Moderate

		8.2 months) post-op (11-49 months after the completion of the intervention program). Intention to treat Mixed model for repeated measures (MMRM) *(i.e. baseline and missing data at T5 used),* *Pearson Correlation,* Sensitivity Analysis		guidance on: nutrition; coping; body image; exercise; mindfulness; and self-monitoring. Control group: conventional post-operative visits (weight, clinical examination and eating behaviour monitoring at 1,3, 6 and 12-months post-op.	(psychosis; suicidal ideation); language or cognitive disability, no internet.		T5 (both groups): observed weight regain; deterioration of psychosocial aspects. T5: intervention group showed significantly lower depression (p = .03, d=-.52) and higher self-efficacy (p = .03, d=.60) compared to control but groups did not differ regarding weight loss and QoL.	
Beaulac and Sandre (2015)	The impact of a CBT psycho-therapy group on post-operative bariatric patients	Pilot cohort analytic intervention study Longitudinal	Clinic psychologists, psychology resident at the weight management	Two groups: (n=9) and (n=8) Two consecutive, eight-week CBT-based psychotherapy	(n=17) Post-operative bariatric patients; 2 male and 15 females;	Emotional Overeating Questionnaire (EOQ)	Short-term group CBT psychotherapy led to significant benefits in psychological	3 - Weak

	pre-post non-randomized design with a 3-month follow-up Paired samples t-tests, comparing baseline to post-treatment periods, then comparing baseline to follow-up	clinic, Ottawa Hospital, Canada	and psychoeducational group intervention. Outcome measures completed at week 1 and week 8. Measures were mailed (postage paid) to participants, 3-months post group completion. Session 1 - introduction to the CBT models Session 2 - coping styles Session 3 - relationship between emotions and food Session 4 - strategies aimed	adults 28-62, mean age 48 (SD = 9.5); 70.6% maternal language English; 70.6% graduated from college or university; 53% were married or common-law; 35.3 % were working full-time; 23.5% were retired; 17.6% on disability leave; 23.5 % on social assistance. Exclusion: severe mental health problems (psychosis; suicidal ideation.	Obesity Adjustment Survey (OAS) Kessler Psychological Distress Scale (K10) The Experiences in Close Relationship Scale (Short-Form; ECR-S) The Outcome Questionnaire-45 (OQ-45) The Client Satisfaction Questionnaire (CSQ8)	well-being in post-operative BS patients. Three of the six paired samples t-tests were statistically significant with large effect sizes. Statistically significant changes from baseline to post-treatment found on the total score for the: OQ-45, K10, OAS (also observed at 3-month follow-up). Participants experienced reduced psychological distress (K10; $t(11) = 6.603$, $p < 0.000$), reduced perceived

		at reducing emotional eating behavior Session 5 - strategies for challenging and reframing cognitive distortions Session 6 - body image Session 7 - relationships and communication styles Session 8 - concepts of relapse prevention	difficulties (OQ-45; t(11) = 3.166, p < 0.009), and improved weight-related adjustment (OAS; t(11) = 2.780, p < 0.018), which remained significantly different when comparing baseline to 3-months follow-up. Large effect sizes were found for improvements at follow-up in the OQ-45 (d= 0.95), K10 (d= 1.99), OAS (d= 0.83), and EOQ (d= 0.53). Small improvements for the ECR (d= 0.31 for anxiety; d=

							0.21 for avoidance).	
Weineland et al (2012)	Psychological flexibility and the gains of acceptance-based treatment for post-bariatric surgery: six-month follow-up and a test of the underlying model	RCT Intention to treat Time by treatment condition interaction Mixed model for repeated measures (MMRM), effect size, mediation analysis	Bariatric team in specialist BS clinic, Sweden	ACT (n=12) and TAU (treatment as usual) (n= 17) ACT: two 90-minute face-to-face clinic sessions emphasising individual behavioural analysis of experiential avoidance (i.e. emotional eating); followed by six 30-min telephone support sessions and internet-based self-help ACT modules exploring: (1) values, (2) acceptance, (3) mindfulness, (4)	Baseline study (n=39) Present follow-up study (n=29) Follow-up retention 74.3% Post-operative bariatric patients; adults 25-59, mean age 43.08; all employed; participants reported an average of 23 years duration of obesity, and 20 years of failed weight loss attempts prior to surgery. Exclusion: severe	Eating disordered behaviour EDE-Q Subjective binge eating questionnaire SBEQ Body shape questionnaire BSQ World Health Org Quality of Life (WHOQOL-Brief) Acceptance and action for weight (AAQ-W) Participants estimated weekly application use and whether they would recommend the package.	The ACT group shows significant improvements as compared with (TAU) at a 6-month follow-up and shows that the mechanism of change may be psychological flexibility. ACT led to gains in QoL (t (59.31) = -2.37, p = .021, d = 0.88) and improvements in body dissatisfaction (t (58.65) = 2.09, p = .041, d = 0.77), as compared with TAU. ACT (t (59.23) = -3.12, p = .003, d = 0.86)	2 - Moderate

				defusion and self as context, (5) committed action and (6) review. Intervention included psycho-education texts, mindfulness audio files, written exercises, and audio-visual animations. TAU: received standard follow-up sessions with the bariatric surgery team (i.e. dietary guidelines, followed-up telephone support as required).	depression and suicidal attempts.		and TAU (t (57.94] = -2.34, p = .023, d = 0.55) showed improvements in eating disordered behaviours. The role of enhanced psychological flexibility in the changes observed in eating disordered behaviour, body dissatisfaction and QoL, is supported by a series of multiple mediator tests.	
Nijamkin et al (2013)	Comprehensive behavioural-motivation-al nutrition	RCT Intention to treat	Bariatric surgeon, dietitian and psychologist in a specialist	Comprehensive (n=72) and standard care (n=72).	(n=144) Retention 85.4%	Body weight was measured using a digital scale.	Participants receiving the comprehensive behavioural-	2 - Moderate

education improves depressive symptoms following bariatric surgery: a randomized controlled trial of obese Hispanic Americans	Independent samples t-tests, regression analysis	laparoscopic institution, USA	Phase 1 clinical trial (preoperative to 6-months after surgery), all participants received standard care. During Phase 2 (6 to 12-months post-operative), participants were randomly assigned to receive either standard care (n=72) or comprehensive support (n=72). Comprehensive group participants received 6 educational sessions focused on behavior change	Post-operative bariatric patients; Hispanic American adults, primarily women (83%); mean age was 44.5 plus/minus 13.5 years; 49% (n = 71) were Cuban born; 46% were married (n = 66); 57% were employed (n = 82); 52% were bilingual (n = 75); participants were well educated (13.7 plus/minus 2.7 mean years of education). Exclusion: non-ambulatory; pregnancy; BS post-operative complications and	A registered dietitian collected nutritional data using 3, 24-hour dietary recalls completed at each assessment visit. Depression: Beck's Depression Inventory (BDI-II) questionnaire Physical activity: self-reported questionnaire based on the Short Questionnaire to Assess Health Enhancing Physical Activity	motivational nutrition-education intervention scored significantly lower on Beck's Depression Inventory questionnaire, compared to those receiving standard care ($p < .001$). Participants with depressive symptoms at randomization: 24% of participants who received the comprehensive intervention reported no depressive symptoms at 12

				strategies and motivation with nutrition counselling.	medical conditions like heart or kidney disease		months after surgery, compared with 6% of those who received standard care ($p < .001$). Participants' depressive mood improvement was significantly and positively associated with attendance at educational sessions and excess weight loss ($p < .001$).	
Himes at al (2015)	Stop Regain: A pilot psycho-logical intervention for bariatric patients experien-cing weight regain	Pilot cohort intervention study Pre-post design Intention to treat	Specialist psychiatric and psychological team at a large academic medical centre, USA	A 6-week group treatment intervention, using a combination of CBT and DBT strategies, lasting 1 hour per week.	(n=28) Retention 67.9% Post-operative gastric bypass patients; mean age 53±9; 93% female; BMI mean of 35.6;	Baseline: SCID I 15-item Distress Tolerance Scale (DTS) The Eating Disorder Diagnostic Scale (EDDS)	Level of depressive symptoms improved for treatment completers ($p \leq .01$). Food records indicated that	3 - Weak

	Repeated measures ANOVA	Early treatment comprised of orienting patients to factors in weight regain, increasing behavioural adherence and accountability through self-monitoring, stress management, diet skills, and managing emotional dysregulation, which can influence disordered eating patterns and other unhealthy practices (i.e. substance misuse). Patients were then introduced to	average weight regain of 37 % of initial weight lost (17 kg); mean time pot-operative 4 years; Caucasian. Exclusion: moderate to severe depression; uncontrolled bipolar disorder; substance dependence and revisional BS	Beck Depression Inventory II (BDI-II) The Eating Disorder Examination-Questionnaire (EDEQ) Questions were also tailored to the bariatric population. Grazing was calculated for the study by reviewing food records.	grazing patterns decreased ($p \leq .01$) and subjective binge eating episodes decreased ($p \leq 0.03$). Weight decreased during the intervention by an average of 1.6±2.38 kg ($p \leq .01$).

				a stepped care approach to weight maintenance.				
Chako et al (2016)	A mindfulness-based intervention to control weight after bariatric surgery: preliminary results from a randomized controlled pilot trial	Pilot RCT Intention to treat Wilcoxon rank sum, t-test, linear and mixed model and sensitivity analysis	Dietician, qualified mindfulness instructor at Beth Israel Deaconess Medical Center, Boston, MA, USA	Mindfulness (MBI) (n=9) and standard care (n=9). MBI: once weekly classes for ten weeks; sessions lasted 90-minutes starting with formal mindfulness practice (e.g. sitting meditation, body scan, walking meditation), followed by group sharing on the week's experience, ending with a teaching session	(n=18) (n=7) MBI completers (n=9) standard care completers Retention 88.8% Post-operative bariatric patients; underwent surgery 1–5 years prior to the start of the intervention; adults 18–65, mean age 53.95; reported < 5 lbs weight loss in the past 3 months. Exclusion: severe psychiatric and personality	BMI (kg/m2) The Three Factor Eating Questionnaire Revised-18 (TFEQ-R18) The Binge Eating Scale (BES) Weight Efficacy Lifestyle Questionnaire (WEL) Physical activity level: tracked using an adapted version of the 7-day physical activity recall and calculated total energy expenditure (kcal/kg) based	Participants reported high satisfaction and overall benefit of MBI. MBI was effective in reducing emotional eating at 6 months (−4.9 ± 13.7 in mindfulness vs. 6.2 ± 28.4 in standard, between-group difference, p = .03) but not weight reduction. Significant increase in HbA1C (0.34 ± 0.38 vs. −0.06 ± 0.31, p = 0.03).	2 - Moderate

	covering a behavioural concept. A half-day retreat (4 hours) of silent meditation was held mid-way through the course. Participants were asked to meditate at home at least six days/week. Audio recordings of guided meditations were provided. Meditation lengths increased each week and were taught in a similar style as in MBSR. Standard care: participants received a 1-hour	disorders; substance misuse; 6-months prior meditation experience.	on metabolic equivalents (METs) QOL: Medical Outcomes Study Short-Form-36 (SF-36) questionnaire Impact of weight on QOL: (IWQOL-Lite) Depression Scale (CES-D) Perceived Stress Scale COPE Biochemical Assays	Though objective measures suggested increased symptoms of depression and perceived stress, participants reported improved eating behaviour, reduced stress reactivity wanted more mindfulness-based support.

				individualized counselling session with a registered dietician at BIDMC. Participants spoke to the dietician about their managing their weight. The dietician provided guidance on nutrition and lifestyle strategies tailored to post-operative patients. Change scores were calculated for all outcomes at baseline, 12-weeks and 6-months.				
Papalazarou et al (2010)	Lifestyle intervention	Cohort analytic intervention study	Dietician in the dietetics	Lifestyle intervention (LS)	(n=30)	BMI (kg/m2)	The LS group showed	2 - Moderate

favourably affects weight loss and maintenance following obesity surgery	Descriptive statistics presented as mean ± s.e.m. One-way ANOVA, Kruskal–Wallis test, χ2-test, Levene's test, Repeated measures ANOVA, Friedman's test, Bonferroni post hoc test, multiple regression analyses	department of the Evagelismos general hospital in Athens, Greece	and usual care (UC). Usual care: patients visited the dietician once weekly for the first 3-months post-operatively; then every other week for the next 3-months; monthly for the following 6-months; every 3-months for the second post-operative year; then every 6-months for the third postoperative year (30 sessions in the 3 years). Post-operative dietary guidelines and general	Post-operative bariatric patients; female patients (mean BMI: 49.5 ± 7.5 kg/m2; age range 21–45, mean age 33.05; history of multiple, failed, previous attempts for weight loss; underwent Vertical banded gastroplasty (Mason technique) at "Evagelismos" general hospital from January 2005 to January 2006. Exclusion: absence of psychiatric illness; male gender.	Dietary intake and meal patterns: food diaries Physical activity: self-reported questionnaire (Harokopio Physical Activity Questionnaire) Eating behavior: the Dutch Eating Behavior Questionnaire (DEBQ)	significant improvements in eating behaviour and weight loss, as compared to UC. At all postoperative time points, the LS group scored significantly better on eating behaviour in the Restraint Eating and External Eating scale and total Dutch Eating Behavior Questionnaire (DEBQ), ($p < .05$). Weight was significantly lower in the LS group after 12 months (84.4 ± 3.9 kg vs.

	information on adopting a healthier lifestyle, was provided during these assessment sessions. LS group: patients attended additional 40-min individualized sessions with the dietitian during these assessment visits. A patient-centered collaborative approach was used, along with behaviour modification techniques, such as goal setting, stimulus control, self-monitoring,	98.4 ± 4.4 kg, p < .05), 24 months (83.0 ± 3.3 vs. 101.9 ± 5.3 kg, p < .05), and 36 months following surgery (84.2 ± 3.3 vs. 102.5 ± 3.5 kg, p < .05). Repeated measures ANOVA showed significant differences between the two groups overall and at specific time points for the PAL and TV viewing (p < .05).

				self-evaluation, reinforcement and relapse control.				
Sockalingam et al (2016)	A pilot study on telephone cognitive behavioural therapy for patients six-months post-bariatric surgery	Uncontrolled single-arm prospective cohort intervention pilot study Pre-post design Mean difference scores, independent t-tests, chi-square, Cohen's d effect size	Master's-level psychologists supervised by two doctoral level registered clinical psychologists, delivered the Tele-CBT, in Canada	Participants received six sessions of Tele-CBT scheduled weekly, lasting around 55 minutes. The focus of the Tele-CBT intervention was overeating and obesity. Sessions included an introduction to the CBT model of obesity, meal scheduling and food records, scheduling pleasurable activities, problem solving strategies	(n=19) Retention 73.7% Post-operative bariatric patients; mean age 46.21±9.03 years; 12 were female; ten patients were in a relationship; participants underwent gastric bypass surgery. Exclusion: ineligibility for BS; lack of computer access; language barrier; significant psychiatric or medical illness	BMI (kg/m2) Binge eating (BES) Emotional eating (EES) Depressive symptoms (PHQ-9) Anxiety symptoms (GAD-7)	Tele-CBT improved post-operative symptoms of psychopathology. Tele-CBT resulted in significant reductions in mean difference scores on BES, EES-Total, EES-Anxiety, EES-Anger, PHQ9, and GAD7. Tele-CBT patients experienced a mean weight loss of 8.62 ± 15.02 kg between 6-months post-	3 - Weak

		to reduce vulnerability, managing difficult eating scenarios and challenging negative thoughts.	operative (pre-Tele-CBT) and 12-months post-operative. Mean difference scores for BES (mean difference = −12.64, 95 % CI [−15.88, −9.40], d = 8.69), EES-total (mean difference = −17.10, 95 % CI [−30.37, −3.83], d = 2.95), EES-anxiety (mean difference = −4.82, 95 % CI [−9.28, −0.35], d = 2.40), and EES-Anger (mean difference = −8.45, 95 % CI [−13.85, −3.06], d = 3.49) scores were significantly

							reduced following Tele-CBT. Participants also experienced significant decreases in PHQ9 (mean difference = −4.09, 95 % CI [−7.23, −0.95], d = 2.90) and GAD7 (mean difference = −2.64, 95 % CI [−4.23, −1.04], d = 3.68) scores after Tele-CBT.	
Bradley et al (2017)	Project HELP: a remotely delivered behavioural intervention for weight regain after bariatric surgery	Pilot cohort intervention study Pre-post design Intent to treat All variables are reported as mean	Program coaches were advanced graduate students with at least 1-year of experience delivering acceptance-based therapies	The intervention (Project HELP): was delivered via online modules. 10 weekly sessions were developed using an e-learning software suite	(n=16) Retention 70% Post-operative bariatric patients; 18–70 years old, mean age 50.7; minimum 1.5 years post-	BMI (kg/m2) Caloric intake: online self-monitoring (MyFitnessPal) Loss of control eating: (EDE-Q) Disinhibition, restraint, and	Significant improvements in weight loss and maintenance, eating behavior and acceptance-based variables. High mean rating (4.7 out of 5.0) of	3 - Weak

	± standard deviation or frequency and percentages, T tests, completer analyses	(ABTs) for weight control, online and via the telephone, in the USA	(i.e., Articulate); hosted on Coursesites (a popular e-learning platform). Participants completed a brief induction tutorial about the technical components of the online program. Assessments time points included: (1) baseline (within 2 weeks prior to starting the intervention), (2) mid-treatment (after completing the fifth online module), (3) post-treatment (at the	operative; ≥10 % weight regain of maximum weight loss or 5 % of their minimum weight post-surgery, and weight regain lasting for at least 3 months prior to enrolment. Exclusion: participation in weight loss programme, pregnancy; medical condition affecting weight; psychiatric illness; suicidality.	reactivity to internal and external cues: The Eating Inventory Emotional Eating: (EES) Grazing behavior: self-report questionnaire Food cravings: (FCQ-T) Physical Activity: The Paffenbarger Physical Activity Recall Acceptance-Based Process Variables: The Acceptance subscale of the Philadelphia Mindfulness Scale (PHLMS) Food Related	program satisfaction among study completers. Treatment completers demonstrated significant weight loss from pre- to post-treatment (5.1 ± 5.5 %; 5.9 ± 6.5 kg, t(10) = 3.02, p = .01). Intent-to-treat analyses also revealed significant weight loss pre- to post-intervention (3.9 ± 5.0 %; 4.4 ± 5.8 kg, t(15) = 3.05, p = .01). On average, weight regain was reversed with a mean weight loss

	completion of the final module), and (4) follow-up (3 months following completion of the final module). Participants were compensated $15 for completing the mid-treatment assessment and $25 for the post-treatment and 3-month follow-up assessments. All assessments were conducted remotely via online questionnaires. Module content (ABT strategies like acceptance, defusion and mindfulness; portion control	Acceptance and Action: (FAAQ) Defusion: Drexel Defusion Physical Activity Acceptance: (PAAQ)	of 5.1 ± 5.5 % throughout the intervention, maintained with an additional average weight loss of 0.6 ± 2.7 % from post-treatment to follow-up. Total average weight loss from pre-treatment to 3-month follow-up was 5.7 ± 6.1 %. Problematic grazing decreased from 36.4 to 9.1 % from pre- to post-treatment. EDE-Q revealed that average frequency of loss of control eating episodes

	and self-control; psychoeducation) included material using text, images, audio, and video to convey session content. Included were interactive exercises and quizzes, examples of other patients utilizing ABT skills and directed assignments to be completed weekly (i.e., Skill Builders). Participants were asked to record their food intake daily using MyFitnessPal and to record their weight and	decreased from 4.3 times to 0.9 times within the previous 4 weeks (M = 3.36, SD = 6.04, t(10) = 1.85, p = .09). Furthermore, loss of control eating episodes decreased from 63.6 to 27.3 % pre- to post-treatment. Residualized changes in hypothesized mediators strongly correlated with residualized changes in weight including: defusion (r = −0.58, p = 0.06), disinhibition (r =

		average daily calories in an online spreadsheet weekly, producing a graph to show progress.	0.55, p = 0.08), reactivity to internal cues (r = 0.71, p = 0.02), eating in response to depression (r = 0.63, p = 0.04), food cravings (r = 0.54, p = 0.09), and food-related acceptance (r = −0.50, p = 0.12). Significant changes in self-reported use of acceptance-based skills: defusion (p = .02, d= .86); cognitive restraint (p< .01, d= 1.84), increased food-related activity (p< .01, d=1.47);

							physical activity related activity (p= .05, d=.69); decreases in anxiety associated with emotional eating (p= .02; d= 0.64).	
Leahey et al (2008)	A cognitive-behavioural mindfulness group therapy intervention for the treatment of binge eating in bariatric surgery patients	Cohort intervention study Pre- post design Mean values, effect sizes	Two clinical psychology doctoral candidates in their fourth year of training, supervised by a licensed psychologist, in a hospital setting, USA	10-week cognitive-behavioural mindfulness-based group intervention, designed to address the specific needs of bariatric surgery patients and to reduce binge eating. Mindfulness-based practices (e.g., increase awareness of food consumption	(n=7) Post-operative bariatric patients; 6 females and 1 male; 5 band; 2 gastric bypass; adults 49 – 64, mean age 54; all were employed or retired; 1 group member was African American; the others were Caucasian; 5 were married or	Eating disorder symptomatology. Eating Disorders Examination Questionnaire EDE-Q (28 days before) The Emotional Eating Scale EES The Eating Self-Efficacy Scale ESES Depression scale - The BDI-II The Difficulties in Emotion Regulation Scale (DERS)	Improvement in binge eating symptoms, depression, emotion regulation and increased motivation to change maladaptive eating behaviour we observed post-treatment. Eating disturbances: all reported reduction in loss of control (d =	3 - Weak

	with associated cues; increase self-acceptance and adaptive coping skills) were added to traditional cognitive-behavioural techniques (e.g., addressing dysfunctional cognitions regarding food and eating; developing alternative coping strategies; improving adherence). Stage 1: psychoeducation, enhance motivation, self-monitoring food intake, and	partnered; 2 had never been married; 6/7 had lost weight following surgery; BMIs ranging from 35.0 to 52.4 at the start of the intervention; all patients had significant medical comorbidities, with the most prevalent being hypertension, diabetes, and hyperlipidaemia; 6/7 were depressed. Exclusion: non-bariatric patients; pre-operative bariatric patients.	Motivation for change - The Stages of Change Readiness and Treatment Eagerness Scale SOCRATES Post-treatment group effectiveness questionnaire. A questionnaire was designed to assess how useful the group was at helping members	1.47); most reported a reduction in guilt (d = 1.26), eating concerns (d = 0.82) and in weight concerns (d = 1.20). The group's Restraint score increased slightly (d = 0.11). Most had an increase in shape concerns (d = 0.78). Perceived eating self efficacy increased for all participants (d = 1.73). Depression: nearly all reported a reduction in depression (d = 1.50). Overall emotion regulation

		develop insight into eating triggers and patterns. Stage 2: group members work to modify their behavior, consistent with post-operative recommendations (i.e. eating 5 to 6 small meals daily, portion and trigger control, not drinking while eating, consuming appropriate amounts of protein and carbohydrate). Stage 3: address problematic thought processes,	difficulties were reduced from (d = 0.57). Motivation for change: nearly all increased activity in changing their problematic eating behaviour (d = 1.06). Weight: the deviation from expected weight loss was reduced from 12.29 to 6.43 pounds. All reported that the intervention was effective.

							improve coping skills and increase mindfulness practices. Participants continue to monitor their food intake, schedule meals, minimize external triggers, and engaging in mindful eating. Stage 4: final stage of treatment focuses on termination, by solidifying newly learned behavior, mindfulness techniques, and emotion-regulation strategies.

Effect sizes calculated according to Cohen's d formula: d= 0.2 (small effect size); d= 0.5 (medium effect size); d= 0.8 (large effect size

Manuscript title: The effectiveness of psychosocial interventions to support psychological well-being in post-operative bariatric patients: a systematic review of evidence

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Statement of ethical standards: The authors have read and abided by the statement of ethical standards for manuscripts submitted to the Obesity Research & Clinical Practice.

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CRediT Author Statement and agreement

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Date agreed (via e-mail): 24.11.19

From: Natascha Van Zyl <Natascha2.Vanzyl@live.uwe.ac.uk>
Sent: Thursday, November 21, 2019 12:01:14 PM
To: Lee Andrews (Student - SOLS) <Lee2.Andrews@live.uwe.ac.uk>; Heidi Williamson <Heidi3.Williamson@uwe.ac.uk>; Jane Meyrick <Jane.Meyrick@uwe.ac.uk>
Subject: SR Credit statement - check

Hello SR Team,

Finally have head space for this.
Doing final edits as we communicate.
Ran a quick search again - nothing new as such to cover the inclusion criteria.
Will update refs with recent Ogden et al 2019 paper which adds support to 'stepped care approach.'

PLEASE CHECK whether you agree with the credit statement applicable to you / order etc. *See word guide below.* Please amend if needed and return to me ASAP - as I want to get this SR off soon.

Thanks everyone.

Tasch

Term	Definition
Conceptualization	Ideas; formulation or evolution of overarching research goals and aims
Methodology	Development or design of methodology; creation of models
Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components
Validation	Verification, whether as a part of the activity or separate, of the overall replication/ reproducibility of results/experiments and other research outputs
Formal analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection
Resources	Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools
Data Curation	Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse
Writing - Original Draft	Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation)
Writing - Review & Editing	Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre-or post-publication stages
Visualization	Preparation, creation and/or presentation of the published work, specifically visualization/ data presentation
Supervision	Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team
Project administration	Management and coordination responsibility for the research activity planning and execution
Funding acquisition	Acquisition of the financial support for the project leading to this publication

From: Heidi Williamson (Staff - HSC) <Heidi3.Williamson@uwe.ac.uk>
Sent: 21 November 2019 00:15
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Subject: Re: SR Credit statement - check

Great stuff!

Fine by me

Bw

Heidi

From: Jane Meyrick <Jane.Meyrick@uwe.ac.uk>
Sent: 22 November 2019 04:11
To: Natascha Van Zyl <Natascha2.Vanzyl@live.uwe.ac.uk>; Lee Andrews <Lee2.Andrews@live.uwe.ac.uk>; Heidi Williamson (Staff - HSC) <Heidi3.Williamson@uwe.ac.uk>
Subject: Re: SR Credit statement - check

All fine. Good luck
Jane

From: Lee Andrews <Lee2.Andrews@live.uwe.ac.uk>
Sent: 24 November 2019 06:26
To: Natascha Van Zyl <Natascha2.Vanzyl@live.uwe.ac.uk>; Heidi Williamson (Staff - HSC) <Heidi3.Williamson@uwe.ac.uk>
Subject: Re: SR Credit statement - check

Evening Natascha

Hope you are having a good weekend.

I can see you been working hard as normal. All seems really good

Kindest regards

Lee