



## Review

# Psychological treatment approaches for improvement of maladaptive eating behaviors in bariatric surgery patients: A systematic review

## *Tratamientos psicológicos para el mejoramiento de las conductas alimentarias desadaptativas en pacientes de cirugía bariátrica: revisión sistemática*

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## Abstract

**Introduction.** Maladaptive eating behaviors (MEB) are highly prevalent among bariatric surgery patients and have been demonstrated to be important contributors for weight loss outcomes. A systematic review was conducted to evaluate the effectiveness of psychological treatment approaches on MEB in bariatric surgery patients.

**Materials and Methods.** This systematic review was registered in PROSPERO. Literature review was performed in the databases PubMed, ScienceDirect, Cochrane Library, and Web of Science. We included



studies published between January 1<sup>st</sup> 1990 and October 18<sup>th</sup> 2019, with pre- or postoperative psychological treatment approaches in bariatric surgery patients aimed to improve MEB.

**Results.** A total of 15 studies met the inclusion criteria (eight RCT and seven pretest-posttest studies), 752 participants were identified, 80.3% were female and the average participant's age was 46.1 years (SD  $\pm$  6.6). Follow-up period after intervention ranged from six weeks to 48 months. Five out of eight RCT reported a positive and significant effect ( $P < 0.05$ ) on MEB and four had medium to large effect size between the groups receiving psychotherapeutic interventions and the control group. Six out of seven pretest-posttest studies reported significant difference ( $P < 0.05$ ) on MEB and had small to large effect size after receiving psychotherapeutic interventions.

**Conclusion.** Overall, the quality of the evidence ranged from low to moderate. Psychological treatments in bariatric surgery patients are inconsistent, though most results indicate improvement on MEB. Well-designed long-term studies and other approaches strategies are warranted to assess the long-term effects on MEB and weight loss in bariatric surgery patients.

#### Keywords

*Maladaptive eating behaviors; Psychological treatment; Psychotherapeutic; Bariatric surgery; Systematic review*

#### Resumen

**Introducción.** Las conductas alimentarias desadaptativas (CAD) son altamente prevalentes en los pacientes de cirugía bariátrica y han sido demostradas ser contribuyentes importantes en los resultados de la pérdida de peso. Una revisión sistemática fue realizada para evaluar la efectividad de los enfoques de tratamientos psicológicos en CAD, en pacientes de cirugía bariátrica.

**Materiales y métodos.** Esta revisión sistemática fue registrada en PROSPERO. La revisión de la literatura fue realizada en las bases de datos de PubMed, ScienceDirect, Cochrane Library y Web of Science. Incluimos estudios publicados entre 1 de enero de 1990 y 18 de octubre de 2019, con enfoques de tratamiento psicológico pre o posoperatorio en pacientes de cirugía bariátrica destinados a mejorar las CAD.

**Resultados.** Un total de 15 estudios reunieron los criterios de inclusión (ocho ensayos clínicos aleatorizados (ECA) y siete estudios preprueba-postprueba), 752 participantes fueron identificados, 80.3% fueron mujeres y la edad promedio de los participantes fue de 46.1 años (DE  $\pm$  6.6). El periodo de seguimiento después de la intervención varió de seis semanas a 48 meses. Cinco de ocho ECA informaron un efecto positivo significativo ( $P < 0.05$ ) en las CAD y cuatro tuvieron un efecto de medio a alto entre los grupos que recibieron intervenciones psicoterapéuticas y el grupo control. Seis de los siete estudios preprueba-postprueba reportaron diferencias significativas ( $P < 0.05$ ) en las CAD y tuvieron un tamaño de efecto de bajo a alto después de recibir intervenciones psicoterapéuticas.



**Conclusión.** En suma, la calidad de la evidencia varió de baja a moderada. Los tratamientos psicológicos en pacientes de cirugía bariátrica son inconsistentes, aunque la mayoría de los resultados indican un mejoramiento en las CAD. Estudios bien diseñados y otras estrategias de enfoque son garantizados para evaluar los efectos a largo plazo de las CAD y la pérdida de peso en pacientes de cirugía bariátrica.

**Palabras clave**

*Conductas alimentarias desadaptativas; Tratamiento psicológico; Psicoterapia; Cirugía bariátrica; Revisión sistemática*

## Introduction

The prevalence of obesity has risen in the past three decades, becoming a worldwide epidemic<sup>(1)</sup>. In 2016, according to the World Health Organization (WHO), over 650 million adults (18 years and older) had obesity<sup>(2)</sup>. Data from the National Health and Nutrition Survey (NHANES) reported a prevalence of obesity among United States (U.S.) adults of 39.8% in 2015-2016<sup>(3)</sup>. Since the 1970s, obesity trends have been increasing in the U.S. regardless of ethnicity, race, age, or gender<sup>(4)</sup>.

Numerous interventions and treatments have been developed to halt the progression of obesity. Metabolic and bariatric surgery (MBS) has become one of the most commonly performed and approved therapies for severe obesity<sup>(5,6)</sup>. Substantial weight loss, remission or improvement of related comorbidities have been widely demonstrated<sup>(7-12)</sup>. Recent research has proven a superior and persistent effect of MBS than medical treatment in medium and long-term periods<sup>(13)</sup>. However, despite the outcomes regarding short- and medium-term weight loss after MBS, treatment failures ( $\leq 50\%$  excess weight loss)<sup>(14,15)</sup> can reach up to 5-20% in gastric bypass and gastric sleeve<sup>(16,17)</sup>, and 14-63% in gastric band<sup>(18)</sup>.

Several non-surgical factors have been identified to be associated with poor weight loss outcomes, weight regain, and weight loss maintenance over time. Associated factors include a variety of demographic, patient-related diseases, and behavioral characteristics, from which older age, greater preoperative weight, obesity-related diseases, physical inactivity, poor follow-up after surgery, self-efficacy, psychosocial and behavioral patterns have been demonstrated to play an important role<sup>(19-22)</sup>. Maladaptive eating behaviors (MEB) are highly prevalent among bariatric surgery patients and have been reported to be much higher compared to the general



population<sup>(23)</sup>. The most common MEB reported in the literature are binge eating, emotional eating, uncontrolled eating, eating in absence of hunger, recurrent episodes of nocturnal eating, and continuous snaking or grazing patterns<sup>(24)</sup>. These problematic eating patterns have been demonstrated to be significant predictors of poor weight outcomes<sup>(25)</sup>. MEB are associated with an increased caloric intake, which causes less weight loss, weight regain, and attenuated long-term weight loss can ultimately cause treatment failure<sup>(24,26-28)</sup>. The association between preoperative MEB and weight loss outcomes after surgery have yielded inconsistent results, while there is consistent evidence of postoperative MEB negatively affect weight loss results<sup>(29)</sup>. However, in the last years, research has been increasing evaluating the impact that have preoperative MEB, specially binge eating, on postoperative outcomes. A recent study reported that patients that presented higher levels of pre-operative emotional eating and food addiction symptoms had poorer weight loss 1 year after follow-up<sup>(30)</sup>. In addition, other psychological factors (depression, anxiety and drug abuse) are also associated with weight loss outcomes and adherence to surgical protocols<sup>(31)</sup>.

Behavioral interventions including psychotherapy have been implemented in bariatric surgery patients before and/or after surgical treatment to improve MEB, better compliance to dietary guidelines, weight maintenance, and to optimize weight loss after surgery. Psychological interventions are characterized by a large variety of therapies, ranging from individual and group therapy to support groups<sup>(32)</sup>. Previous systematic reviews which evaluated behavioral management including psychotherapeutic interventions and support groups in bariatric surgery patients have demonstrated a positive effect on weight loss outcomes<sup>(32-34)</sup>. Most of the psychological treatment approaches developed for improvement of MEB implement or are based on principles of cognitive behavioral therapy (CBT), acceptance-commitment therapy, mindfulness, adapted motivational interviewing, and psychoeducational groups. These therapeutic strategies provide skills to regulate eating patterns, stimulate self-control, create assertiveness/problem-solving skills, increase self-esteem and motivation to change<sup>(35,36)</sup>.

The aim of this systematic review is to evaluate the effectiveness of pre- or postoperative psychological treatment approaches on MEB in bariatric surgery patients.



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## Methods

### *Protocol and Registration*

The protocol of the present study was registered at the international database of prospectively registered systematic reviews in health and social care (PROSPERO), the registration number is CRD42018108443.

### *Literature search strategy*

The present study was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) recommendations<sup>(37)</sup>. A comprehensive literature review was performed in the databases MEDLINE (PubMed), ScienceDirect, Cochrane Library, and Web of Science. Additionally, we performed a manual review of the reference list of retrieved articles for any other related study not included in our database search. Literature search was limited to include studies between January 1<sup>st</sup> 1990 and October 18<sup>th</sup> 2019. The following combinations of search terms were used: “psychotherapy” OR “psychotherapeutic” OR “psychological” OR “psychosocial” OR “behavioral” OR “behavioral interventions” OR “behavioral therapy” OR “cognitive” OR “cognitive intervention” OR “mindfulness” OR “mindfulness interventions” AND “bariatric surgery” OR “weight loss surgery” OR “bypass” OR “gastric sleeve” OR “gastric band”. The literature search was conducted by two reviewers (PRC and CIFG). The last search was conducted on October 18<sup>th</sup>, 2019.

### *Study selection and inclusion criteria*

Randomized controlled trials (RCT) and pretest-posttest studies were included based on the following inclusion criteria:

1. Aged  $\geq 18$  years with a minimum follow-up period equal or greater than four weeks.
2. Bariatric surgery patients (patients who underwent bariatric surgery or bariatric surgery candidates or subjects in a bariatric surgery program).
3. Studies that performed pre- or postoperative psychological treatment approaches aimed to improve MEB.
4. Studies that reported pre- and post-intervention outcomes on MEB or problematic eating patterns, including binge eating, emotional eating, uncontrolled eating, eating in absence of hunger, night-eating, grazing, snacking, picking patterns, etc.



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### *Data extraction and quality assessment*

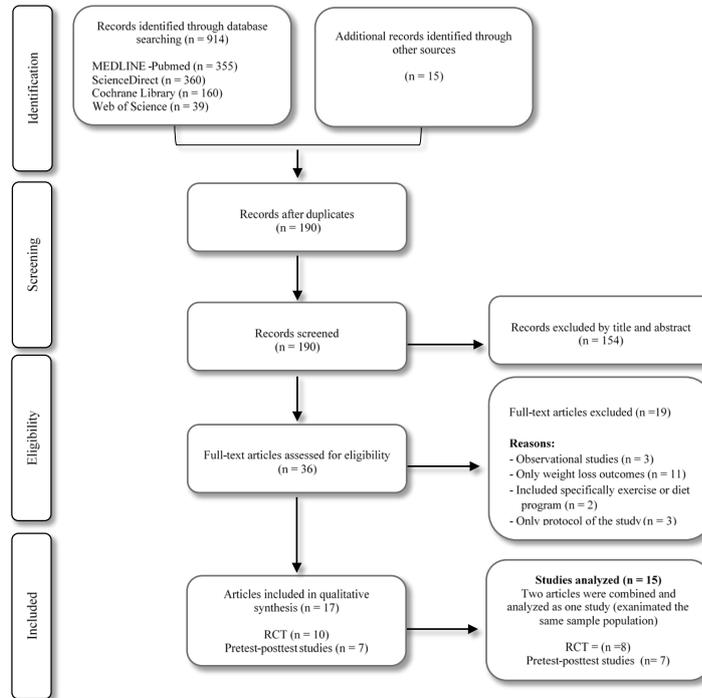
All data extraction was performed by the first author and double-checked by two other authors (CIFG and MBG). Discrepancies were solved through consultation and consensus. Data was collected from the full-text articles and was pooled. Data regarding the study design, sample size, participant's characteristics (mean age and gender), follow-up period, retention rate, type of intervention, and outcomes measured were obtained (Table 1). Data was organized according to the study design (i.e. RCT and pretest-posttest studies) and by the period of intervention (pre- or postoperative intervention). Primary outcomes analyzed were MEB and secondary outcomes were weight loss, anxiety and depression symptoms. When there was more than one publication of the same study population, the articles were combined and information was collected from the article that reported the primary outcomes and that had the longest follow-up. Effect size of the primary outcomes (MEB) was extracted from the studies when available, when not reported and data was available, Cohen  $d$  effect size was calculated.

Quality of evidence was rated based on the Grading of Recommendations Assessment, Development and Evaluation system, that classifies the evidence as high, moderate, low or very low quality<sup>(38)</sup>. Evidence was divided into primary outcomes (MEB) and secondary outcomes (weight loss, anxiety and depression symptoms). Quality of the evidence was rated based on the study design, risk of bias, inconsistency and imprecision of results.

## **Results**

### *Literature search*

The preliminary search throughout the databases and manual search provided a total of 929 citations. The selection process of the studies is illustrated in a flow diagram (Figure 1).



**Figure 1.** Flow diagram of the study selection process.

**Study and participant’s characteristics**

A total of 15 studies were analyzed in this systematic review. Seventeen articles were included, of which two of these assessed the same sample population in different follow-up periods. These articles were combined and analyzed as one study. We included eight randomized controlled trials<sup>(39-48)</sup> and seven pretest-posttest studies<sup>(31,49-54)</sup>. Retention rate among the studies ranged from 63% to 100%. A total of 752 participants were identified from all the studies and sample size ranged from 7 to 243 participants. Gender distribution was primarily female (80.3%) and the average participant’s age was 46.1 years (SD ± 6.6). Follow-up period after intervention ranged from 6 weeks to 48 months. Data collected from each study is summarized in Table 1.



**Table 1.** Study characteristics.

Author	Country	Type of study	Sample size	Mean age ± SD	Follow-up, mo ± SD	Retention rate (%)	Type of psychological treatment approach	Outcomes measured	Effect size of MEB	Group differences (p)
<i>Intervention after surgery</i>										
Wild et al. 2017, 2015	Germany	RCT	74 (female 68.9%)	41.4 ± 8.8; 41.3 ± 9.8	37.9 ± 8.2	63.2	Videoconferencing-based psychoeducational group	Eating disorder	-	0.65
								Quality of life	-	0.65
								Self-efficacy	Medium	<b>0.03</b>
								Depression severity	-	<b>0.03</b>
								Weight loss	-	0.82
Chacko et al., 2016	Israel	RCT	18 (female 83.3%)	53.4 ± 5.6; 54.5 ± 7.8	6	100	Mindfulness-based	Emotional eating	N/A	<b>0.03</b>
								Binge eating	-	0.47
								Cognitive restraint	-	0.27
								Uncontrolled eating	-	0.98
								Eating self-Efficacy	-	0.64
								Quality of life	-	0.30
								Depression	-	0.74
								Perceived stress	-	0.43
								Weight loss	-	0.28
								Weinland et al., 2012	Sweden	RCT
Eating disorder-shape concerns	Large	<b>0.009</b>								
Eating disorder-weight concerns	Medium	<b>0.03</b>								
Eating disorder-restraint eating	-	0.55								
Eating disorder-eating concerns	-	0.42								
Binge eating	Large	<b>0.006</b>								
Self-perceived body dissatisfaction	Medium	<b>0.023</b>								
Acceptance of weight	Large	<b>0.006</b>								
Quality of life	-	<b>0.022</b>								
David et al., 2016	Canada	RCT	51 (female 87%)	49.2 ± 9.1	2.8	90.2	Adapted motivational interviewing	Binge eating	Medium	<b>&lt;0.01</b>
								Self-efficacy	-	NS*
								Confidence to change	Small	<b>&lt;0.05</b>
Papalazarou et al., 2010	Greece	RCT	30 (female 100%)	32.7 ± 1.6; 33.4 ± 2.0	36	100	Lifestyle intervention including elements of CBT	Eating behavior-restrained eating	Large	<b>&lt;0.001</b>
								Eating behavior-emotional eating	-	0.858
								Eating behavior-eating in response to external food-related stimuli	Large	<b>&lt;0.001</b>
								PAL	-	<b>0.001</b>
								Weight loss	-	<b>&lt;0.001</b>



**Table 1. (continued)**

Author	Country	Type of study	Sample size	Mean age ± SD	Follow-up, mo ± SD	Retention rate (%)	Type of psychological treatment approach	Outcomes measured	Effect size of MEB	Difference before and after (p)
<i>Intervention after surgery</i>										
Beaulac and Sandre, 2015	Canada	Pre-post	17 (female 88.2%)	48 ± 9.5	3	100	CBT	Emotional overeating Anxiety and depression Perceived difficulties in their lives Feelings in relation to their weight, relationships, and activities Psychological distress	Medium	<b>0.05</b> 0.78 <b>0.009</b> <b>0.018</b> <b>0.0001</b>
Wnuk et al., 2018	Canada	Pre-post	22 (female 100%)	55.4 ± 9.4	4	77.3	Mindfulness-based eating and awareness training	Binge eating Emotional eating-anger Emotional eating-anxiety Emotional eating-depression Depression Anxiety General emotion regulation Weight loss	- - Small -	0.16 0.16 0.07 0.30 0.76 0.11 <b>0.04</b> 0.94
Bradley et al., 2016	USA	Pre-post	11 (female 63.6%)	53.4 ± 8.7	2.3	72.7	Acceptance-based behavioral	Eating disorder-general Emotional eating-anger Emotional eating-anxiety Emotional eating-depression Food cravings Grazing behavior Disinhibition eating Restraint eating Acceptance of the internal experiences associated with food Weight loss	- - - - Medium Medium Medium Large	NS* 0.63 0.30 0.18 <b>0.04</b> 0.41 0.07 <b>0.05</b> <b>0.01</b> <b>0.01</b>
Bradley et al., 2017	USA	Pre-post	11 (female 72.7%)	50.7 ± 13.7	3	70	Acceptance-based behavioral	Emotional eating-general Emotional eating-anger Emotional eating-depression Emotional eating-anxiety Food cravings Disinhibition eating Restraint eating Acceptance of the internal experiences associated with food Physical activity Weight loss	- - - Medium - Medium Large	0.09 0.25 0.08 <b>0.02</b> 0.13 <b>0.02</b> <b>0.01</b> Large <b>&lt;0.01</b> <b>0.05</b> <b>0.01</b>
Himes et al., 2015	USA	Pre-post	28 (female 93%)	53 ± 9	1.4 (6 weeks)	67.9	CBT and DBT	Binge eating Grazing behavior-snacks per day Grazing behavior-eating episodes per day Depression symptoms Weight loss	Medium Medium Medium	<b>0.03</b> <b>0.01</b> <b>0.01</b> <b>0.01</b> <b>&lt;0.01</b>



**Table 1.** (continued)

Author	Country	Type of study	Sample size	Mean age ± SD	Follow-up, mo ± SD	Retention rate (%)	Type of psychological treatment approach	Outcomes measured	Effect size of MEB	Difference before and after (p)
<i>Intervention after surgery</i>										
Sockalingam et al., 2017	Canada	Pre-post	19 (female 86%)	46.2 ± 9.0	1.6 (7 weeks)	73.7	Telephone-based CBT	Binge eating Emotional eating-general Emotional eating-anxiety Emotional eating-depression Emotional eating-anger Anxiety Depression Weight loss	Large Large Large - Large - - Large	<0.001 0.02 0.04 0.08 0.01 <0.01 0.01 0.28
<i>Intervention before surgery</i>										
Ashton et al., 2009	Norway	Pre-post	243 (female 82.3%)	47 ± 11.6	1	100	CBT	Binge eating	N/A	<0.001
Hjelmsæth et al., 2019	Norway	RCT	61 (female 70%)	42.4 ± 10.1	48	66	CBT	Emotional eating Uncontrolled eating Cognitive restraint Anxiety Depression Weight loss	- - - - - -	0.22 0.47 0.19 0.16 0.02 0.76
Cassin et al., 2016	Canada	RCT	47 (female 83%)	45.5 ± 8.9	1.6 (7 weeks)	74.5	Telephone-based CBT	Binge eating Emotional eating-anger Emotional eating-anxiety Emotional eating-depression Psychosocial functioning Anxiety	Large Large Large Large - -	<0.01 <0.001 <0.01 <0.001 <0.001 <0.001 <0.001
Gade et al., 2014, 2015	Norway	RCT	80 (female 68.8%)	40 ± 10	12	100	CBT	Emotional eating Uncontrolled eating Cognitive restraint of eating Anxiety and depression Weight loss	- - - - -	NS* NS* NS* NS* 0.81

RCT = randomized control trial; SD = standard deviation; CBT = cognitive-behavioral therapy; DBT = dialectical behavior therapy; BMI = body mass index; PAL = physical activity level; NS\* = authors did not report *p* number, but they reported that *p* was no significant.; N/A = Not available; - = Not included since it is not significant.

*Psychological treatment approaches*

Of the four studies that assessed the efficacy of preoperative interventions, three were RCT<sup>(39,42-44)</sup> and one was pretest-posttest study<sup>(49)</sup>. Of the eleven studies that assessed postoperative interventions, five were RCT<sup>(40,41,45-48)</sup> and six were pretest-posttest studies<sup>(31,50-54)</sup>. The psychological interventions performed among the studies included were as follows: cognitive-behavioral therapy (CBT), acceptance-based and acceptance and commitment therapy, mindfulness-based therapy, psychoeducational group, and adapted motivational interviewing.

Eight studies included principles of CBT<sup>(31,39,42-45,49,50,53)</sup>, and two of these were performed through phone calls<sup>(39,53)</sup>. Two studies included an acceptance-based behavioral therapy<sup>(51,52)</sup>, and one study an acceptance and commitment therapy<sup>(46)</sup>. Mindfulness-based therapy was performed in two studies<sup>(40,56)</sup>. One study performed a videoconferencing-based psychoeducational group<sup>(47,48)</sup>, and another study performed adapted motivational interviewing<sup>(41)</sup>.



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*Primary outcome: Maladaptive eating behaviors*

All studies reported the examination questionnaires used or applied to measure MEB in their participants. MEB evaluated among the studies included: eating disorders symptoms (general, restraint, related to shape, weight and eating concerns), emotional eating (related to anger, anxiety and depression), binge eating, emotional overeating or uncontrolled eating, disinhibition eating, food cravings, grazing behaviors, and eating self-efficacy. Other behaviors or issues related with MEB were evaluated, such as self-perceived body dissatisfaction, acceptance of weight, confidence of change, and acceptance of the internal experiences associated with food. The most frequent MEB recorded among the studies was emotional eating (11 out of 15) followed by binge eating (8 out of 15).

Overall, all the studies reported an improvement of MEB. However, some of the studies did not report a significant effect compared with the control group (RCT) or after the intervention (pretest-posttest studies). Five out of eight RCT (1 preoperative intervention; 4 postoperative intervention) reported a significant effect ( $P < 0.05$ ) and four had a medium to large effect size between the groups receiving psychological intervention and the control group. Six out of seven pretest-posttest studies (5 postoperative intervention; 1 preoperative intervention) reported significant difference ( $P < 0.05$ ) and had a small to large effect size after receiving psychological intervention.

The study conducted by Hjelmessaeth et al.<sup>(44)</sup>, reported a significant improvement after psychological intervention compared with the control group of emotional eating ( $P = 0.031$ ), uncontrolled eating ( $P < 0.001$ ), and cognitive restraint ( $P < 0.001$ ). However, these results were reported after a follow-up of 4 months and after psychological intervention (4 weeks before surgery) and these effects disappeared after a follow-up of 1 year and 4 years after surgery.

*Secondary outcomes: weight loss, anxiety and depression symptoms*

Ten out of 15 studies (four RCT and five pretest-posttest studies) assessed weight loss. Only one (postoperative intervention) of the four RCT reported significant ( $P < 0.05$ ) weight loss after psychological intervention compared with the control group. Three (two postoperative intervention and one preoperative intervention) out of five pretest-posttest studies reported significant weight loss difference ( $P < 0.05$ ) after receiving psychological intervention.

Four pretest-posttest studies (postoperative intervention), and three RCT (preoperative intervention) assessed anxiety and depression symptoms. Four studies (three pretest-posttest studies and one RCT) reported significant improvement in depression symptoms, and two



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studies (one pretest-posttest studies and one RCT) reported significant improvement in anxiety symptoms.

#### *Quality of the evidence*

Based on the GRADE system, the quality of the evidence of the primary outcomes rated from low to moderate. Seven out of 15 studies included were not randomized controlled trials, and 66% of the studies presented a follow-up period of less than six months. Four out of seven RCT had a medium to large effect size. Only four studies assessed MEB for participant's recruitment.

## Discussion

To our knowledge, this is the first systematic review aimed to assess psychological intervention approaches for MEB in bariatric surgery patients. The main finding of this study is that psychological interventions (regardless of type of therapy performed) have a positive effect on MEB in bariatric surgery patients at short-term periods. However, the quality of the evidence rated from low to moderate and the effect was not sustained after 12 months of follow-up.

Better results were observed in the studies with a shorter follow-up period. Four studies presented a follow-up period greater than 12 months and only one showed significant improvement on MEB. Therefore, the medium and long-term effect of psychological treatment remain uncertain. The study with the longest follow-up (four years) reported no clinical effects on MEB at the end of the follow-up period<sup>(44)</sup>. The immediate effect showed after 10-weeks of psychological treatment disappeared at the first and fourth year of follow-up. On the other hand, another study with a follow-up of three years<sup>(45)</sup>, reported significant effects on MEB after the end of the follow-up. However, this study conducted several sessions during the three years of follow-up, which suggests that a continuous intervention might result in a sustained positive effect on MEB.

Two systematic reviews and meta-analysis have been published, which evaluated the effect of psychotherapeutic interventions and support groups on weight loss in bariatric surgery patients<sup>(32,33)</sup>, but they do not include specific assessment of MEB. These studies showed that those patients attending psychotherapy or support groups, combined with the surgical treatment, appear to experience greater weight loss than patients treated with bariatric surgery alone.



The major strengths of this study are that more than half of the studies were RCTs (eight out of 15), and almost all of the studies (12 out of 15) presented a relatively high retention rate (>70 %).

Limitations for this review are the lack of high-quality studies, the lack of statistical power of the studies included, the combination of studies with short and medium-term follow-ups, and the inclusion of a wide variety of psychological treatments. Additionally, the inconsistency of the results between the studies with similar follow-up periods might be associated with differences on the assessment of MEB. Another limitation is that only four studies performed a basal or initial evaluation of the recruitment of the participants' sample (31,47,49,50).

The improvement of MEB among bariatric surgery subjects receiving psychological treatment is small. Metabolic and bariatric surgery might have a beneficial impact on eating behaviors; however, this effect does not remain at 12 or more months<sup>(42,55)</sup>. One study with a follow up of three years shows a positive effect of psychological treatment when these continue over time, which suggest that long term interventions are warranted and should be assessed<sup>(45)</sup>.

## Conclusion and recommendations

In the present systematic review positive effects on MEB were shown after psychological treatment at short-term follow-up. However, the quality of the evidence rated from low to moderate, and outcomes at  $\geq 12$  months of follow-up showed no effect on MEB. Continuous and close monitoring, identification of MEB before and after surgery, and recurrent supportive pre- and postoperative interventions including psychotherapy are important to maximize surgical outcomes. Further high-quality studies are warranted to assess the effect of psychological treatment for MEB at long-term.

## Conflicts of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.



## Referencias

1. M. Ng, T. Fleming, M. Robinson, et al., "Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013," *The Lancet*, vol. 384, no. 9945, pp.766-81, 2014.
2. World Health Organization, "Obesity and overweight 2018," (Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>).
3. C.M. Hales, M. D. Carroll, C. D. Fryar, C. L. Ogden, "Prevalence of Obesity Among Adults and Youth: United States, 2015–2016," *NCHS Data Brief*, vol. 288, pp. 1-8, 2017.
4. E. P. Williams, M. Mesidor, K. Winters, P. M. Dubbert, S. B. Wyatt, "Overweight and Obesity: Prevalence, Consequences, and Causes of a Growing Public Health Problem," *Current obesity reports*, vol. 14, no. 3, pp. 363-70, 2015.
5. M. Fried, V. Yumuk, J. M. Oppert, et al., "Interdisciplinary European Guidelines on Metabolic and Bariatric Surgery," *Obes Surg*, vol. 24, no. 1, pp. 42-55, 2014.
6. National Heart, Lung, and Blood Institute - NIH, "Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report Rockville, Md: National Heart, Lung, and Blood Institute," 1998.
7. I. Rasera Jr, A. Luque, S.M. Junqueira Jr, N. C. Brasil, P. C. Andrade, "Effectiveness and Safety of Bariatric Surgery in the Public Healthcare System in Brazil: Real-World Evidence from a High-Volume Obesity Surgery Center," *Obes Surg*, vol. 27, no. 2, pp. 536-40, 2017.
8. N. Puzziferri, T. B. Roshek 3rd, H. G. Mayo, R. Gallagher, S. H. Belle, E. H. Livingston, "Long-term follow-up after bariatric surgery: a systematic review," *JAMA*, vol. 312, no. 9, pp. 934-42, 2014.
9. S. H. Chang, C. R. Stoll, J. Song, J.E Varela, C. J. Eagon, G. A. Colditz, "The effectiveness and risks of bariatric surgery: an updated systematic review and meta-analysis, 2003-2012," *JAMA surgery*, vol. 149, no. 3, pp. 275-87, 2014.
10. M. Khosravi-Largani, M. Nojomi, R. Aghili, et al., "Evaluation of all Types of Metabolic Bariatric Surgery and its Consequences: a Systematic Review and Meta-Analysis," *Obes Surg*, vol. 29, no. 2, pp. 651-690, 2019.
11. P. Ruiz-Cota, M. Bacardi-Gascon, A. Jimenez-Cruz A, "Long-term outcomes of metabolic and bariatric surgery in adolescents with severe obesity with a follow-up of at



- 
- least 5 years: A systematic review," *Surg Obes Relat Dis*, vol. 15, no. 1, pp. 133-144, 2019.
12. P.E. O'Brien, A. Hindle, L. Brennan, et al., "Long-Term Outcomes After Bariatric Surgery: a Systematic Review and Meta-analysis of Weight Loss at 10 or More Years for All Bariatric Procedures and a Single-Centre Review of 20-Year Outcomes After Adjustable Gastric Banding," *Obes Surg*, vol. 29, no. 1, pp. 3-14, 2019.
  13. Z. Khorgami, S. Shoar, A. A. Saber, C. A. Howard, G. Danaei, G. M. Sclabas, "Outcomes of Bariatric Surgery Versus Medical Management for Type 2 Diabetes Mellitus: a Meta-Analysis of Randomized Controlled Trials," *Obes Surg*, vol. 29, no. 3, pp. 964-974, 2019.
  14. J. P. Mann, A. D. Jakes, J. D. Hayden, J. H. Barth, "Systematic review of definitions of failure in revisional bariatric surgery," *Obes Surg*, vol. 25, no. 3, pp. 571-4, 2015.
  15. American Society for Metabolic and Bariatric Surgery, "Bariatric Surgery Misconceptions," (Available from: <https://asmbs.org/patients/bariatric-surgery-misconceptions>).
  16. M. Livhits, C. Mercado, I. Yermilov, et al., "Behavioral factors associated with successful weight loss after gastric bypass," *Am Surg*, vol. 76, no. 10, pp. 1139-42, 2010.
  17. L. Salem, C. C. Jensen, D. R. Flum, "Are bariatric surgical outcomes worth their cost? A systematic review," *J Am Coll Surg*, vol. 200, no. 2, pp. 270-8, 2005.
  18. N. J. Switzer, S. Karmali, R. S. Gill, V. Sherman, "Revisional Bariatric Surgery," *Surg Clin North Am*, vol. 96, no. 4, pp. 827-42, 2016.
  19. G. M. Campos, C. Rabl, K. Mulligan, et al., "Factors associated with weight loss after gastric bypass," *Arch Surg*, vol. 143, no. 9, pp. 877-83, 2008.
  20. D. B. Sarwer, T. A. Wadden, A. N. Fabricatore, "Psychosocial and behavioral aspects of bariatric surgery," *Obes Res*, vol. 13, no. 4, pp. 639-48, 2005.
  21. A. Maleckas, R. Gudaitytė, R. Petereit, L. Venclauskas, D. Veličkienė, "Weight regain after gastric bypass: etiology and treatment options," *Gland surgery*, vol. 5, no. 6, pp. 617-24, 2016.
  22. J. Odom, K. C. Zalesin, T. L. Washington, et al., "Behavioral Predictors of Weight Regain after Bariatric Surgery," *Obes Surg*, vol. 20, no. 3, pp. 349-56, 2010.
  23. J. E. Mitchell, W. C. King, A. Courcoulas, et al., "Eating behavior and eating disorders in adults before bariatric surgery," *Int J Eat Disord*, vol. 48, no. 2, pp. 215-22, 2015.



24. E. Conceição, J. E. Mitchell, A. R. Vaz, et al., "The presence of maladaptive eating behaviors after bariatric surgery in a cross sectional study: Importance of picking or nibbling on weight regain," *Eating Behaviors*, vol. 15, no. 4, pp. 558-62, 2014.
25. A. Pinto-Bastos, M. de Lourdes, I. Brandão, P. P. P Machado, E .M Conceição, "Weight loss trajectories and psychobehavioral predictors of outcome of primary and reoperative bariatric surgery: a 2-year longitudinal study," *Surg Obes Relat Dis*, vol. 15, no. 7, pp. 1104-112, 2019.
26. M. A. Kalarchian, W. C. King, M. J. Devlin, et al., "Psychiatric Disorders and Weight Change in a Prospective Study of Bariatric Surgery Patients: A 3-Year Follow-Up," *Psychosom Med*, vol. 78, no. 3, pp. 373-81, 2016.
27. C. S. Brode, J.E. Mitchell, "Problematic Eating Behaviors and Eating Disorders Associated with Bariatric Surgery," *Psychiatr Clin North Am*, vol. 42, no. 2, pp. 287-97, 2019.
28. M. A. Kalarchian, M. D. Marcus, M.D. Levine, et al., "Psychiatric disorders among bariatric surgery candidates: relationship to obesity and functional health status," *Am J Psychiatry*, vol. 164, no. 2, pp. 328-34, 2007.
29. G. A. Williams-Kerver, K. J. Steffen, J. E. Mitchell, "Eating Pathology After Bariatric Surgery: an Updated Review of the Recent Literature," *Current psychiatry reports*, vol. 21, no. 9, pp. 86, 2019.
30. L. R. Miller-Matero, K. Bryce, C. K. Saulino, K. E. Dykhuis, J. Genaw, A. M. Carlin, "Problematic Eating Behaviors Predict Outcomes After Bariatric Surgery," *Obes Surg*, vol. 28, no. 7, pp. 1910-5, 2018.
31. S. M. Himes, K. B. Grothe, M. M. Clark, J. M. Swain, M. L. Collazo-Clavell, M. G. Sarr, "Stop regain: a pilot psychological intervention for bariatric patients experiencing weight regain," *Obes Surg*, vol. 25, no. 5, pp. 922-7, 2015.
32. N. N. Beck, M. Johannsen, R. K. Stoving, M. Mehlsen, R. Zachariae, "Do postoperative psychotherapeutic interventions and support groups influence weight loss following bariatric surgery? A systematic review and meta-analysis of randomized and nonrandomized trials," *Obes Surg*, vol. 22, no. 11, pp. 1790-7, 2012.
33. A. Rudolph, A. Hilbert, "Post-operative behavioural management in bariatric surgery: a systematic review and meta-analysis of randomized controlled trials," *Obes Rev*, vol. 14, no. 4, pp. 292-302, 2013.



34. F. Stewart, A. Avenell, "Behavioural Interventions for Severe Obesity Before and/or After Bariatric Surgery: a Systematic Review and Meta-analysis," *Obes Surg*, vol. 26, no. 6, pp. 1203-14, 2016.
35. J. A. Brewer, A. Ruf, A. L. Beccia, et al., "Can Mindfulness Address Maladaptive Eating Behaviors? Why Traditional Diet Plans Fail and How New Mechanistic Insights May Lead to Novel Interventions," *Front Psychol*, vol. 9, pp. 1418, 2018.
36. A. Wenzel, "Basic Strategies of Cognitive Behavioral Therapy2," *Psychiatr Clin North Am*, vol. 40, no. 4, pp. 597-609, 2017.
37. D. Moher, L. Shamseer, M. Clarke, et al., "Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement," *Syst Rev*, vol. 4, no. 1, 2015.
38. GRADE Work Group, "Grading quality of evidence and strength of recommendations," *BMJ*, vol. 328, no. 7454, pp. 490, 2004.
39. S. E. Cassin, S. Sockalingam, C. Du, S. Wnuk, R. Hawa, S. V. Parikh, "A pilot randomized controlled trial of telephone-based cognitive behavioural therapy for preoperative bariatric surgery patients," *Behav Res Ther*, vol. 80, pp. 17-22, 2016.
40. A. S. Chacko, G. Y. Yeh GY, R. B. Davis, C. C. Wee, "A mindfulness-based intervention to control weight after bariatric surgery: Preliminary results from a randomized controlled pilot trial," *Complement Ther Med*, vol. 28, pp. 13-21, 2016.
41. L. A. David, S. Sockalingam, S. Wnuk, S. E. Cassin, "A pilot randomized controlled trial examining the feasibility, acceptability, and efficacy of Adapted Motivational Interviewing for post-operative bariatric surgery patients," *Eat Behav*, vol. 22, pp. 87-92, 2016.
42. H. Gade, O. Friberg, J. H. Rosenvinge, M. C Smastuen, J. Hjelmesaeth J, "The Impact of a Preoperative Cognitive Behavioural Therapy (CBT) on Dysfunctional Eating Behaviours, Affective Symptoms and Body Weight 1 Year after Bariatric Surgery: A Randomised Controlled Trial," *Obes Surg*, vol. 25, no. 11, pp. 2112-9, 2015.
43. H. Gade, J. Hjelmesaeth, J. H. Rosenvinge, O. Friberg, "Effectiveness of a Cognitive Behavioral Therapy for Dysfunctional Eating among Patients Admitted for Bariatric Surgery: A Randomized Controlled Trial," *J Obes*, 2014.
44. J. Hjelmesaeth, J. H. Rosenvinge, H. Gade, O. Friberg, "Effects of Cognitive Behavioral Therapy on Eating Behaviors, Affective Symptoms, and Weight Loss After Bariatric Surgery: a Randomized Clinical Trial," *Obes Surg*, vol. 29, no. 1, pp. 61-9, 2019.



45. A. Papalazarou, M. Yannakoulia, S. A. Kavouras, et al., "Lifestyle intervention favorably affects weight loss and maintenance following obesity surgery," *Obesity (Silver Spring, Md)*, vol. 18, no. 7, pp. 1348-53, 2010.
46. S. Weineland, D. Arvidsson, T. P Kakoulidis, J. Dahl, "Acceptance and commitment therapy for bariatric surgery patients, a pilot RCT," *Obes Res Clin Pract*, vol. 6, no. 1, pp. e1-e90, 2012.
47. B. Wild, K. Hunnemeyer, H. Sauer H, et al., "A 1-year videoconferencing-based psychoeducational group intervention following bariatric surgery: results of a randomized controlled study," *Surg Obes Relat Dis*, vol. 11, no. 6, pp. 1349-60, 2015.
48. B. Wild, K. Hunnemeyer, H. Sauer, et al., "Sustained effects of a psychoeducational group intervention following bariatric surgery: follow-up of the randomized controlled BaSE study," *Surg Obes Relat Dis*, vol. 13, no. 9, pp. 1612-8, 2017.
49. K. Ashton, M. Drerup, A. Windover, L. Heinberg, "Brief, four-session group CBT reduces binge eating behaviors among bariatric surgery candidates," *Surg Obes Relat Dis*, vol. 5, no. 2, pp. 257-62, 2009.
50. J. Beaulac, D. Sandre, "Impact of a CBT psychotherapy group on post-operative bariatric patients," *SpringerPlus*, vol. 4, pp. 764, 2015.
51. L. E. Bradley, E. M Forman, S. D. Kerrigan, M. L. Butryn, J. D. Herbert, D. B. Sarwer, "A Pilot Study of an Acceptance-Based Behavioral Intervention for Weight Regain After Bariatric Surgery," *Obes Surg*, vol. 26, no. 10, pp. 2433-41, 2016.
52. L. E. Bradley, E. M. Forman, S. G. Kerrigan, et al., "Project HELP: a Remotely Delivered Behavioral Intervention for Weight Regain after Bariatric Surgery," *Obes Surg*, vol. 27, no. 3, pp. 586-98, 2017.
53. S. Sockalingam, S. E. Cassin, S Wnuk, et al, "A Pilot Study on Telephone Cognitive Behavioral Therapy for Patients Six-Months Post-Bariatric Surgery," *Obes Surg*, vol. 27, no. 3, pp. 670-5, 2017.
54. S. M. Wnuk, C. M. Du, J. Van Exan, et al., "Mindfulness-Based Eating and Awareness Training for Post-Bariatric Surgery Patients: a Feasibility Pilot Study," *Mindfulness*, vol. 9, no. 3, pp. 949-60, 2018.
55. C. L. Wimmelmann, F. Dela, E. L. Mortensen, "Psychological predictors of weight loss after bariatric surgery: A review of the recent research," *Obes Res Clin Pract*, vol. 8, no. 4, pp. e299-e313, 2014.

