

REVIEW



Cognitive behavioral therapy and predictors of weight loss in bariatric surgery patients

Linda Paul^a, Colin van der Heiden^{b,c}, and Hans W. Hoek^{d,e,f}

Purpose of review

Bariatric surgery is the most effective treatment for morbid obesity. However, 20–30% of patients undergoing bariatric surgery experience premature weight stabilization or weight regain postoperatively. We report on the recent literature of predictors of weight loss and the efficacy of cognitive behavioral therapy (CBT) in bariatric patients.

Recent findings

Preoperative disordered eating behaviors do not appear to be significantly predictive of postoperative weight loss. Postoperative disordered eating behaviors, eating disorders, and depressive symptoms have been found to be associated with less optimal weight loss results. Recent studies show that CBT can contribute in reducing disordered eating behaviors and depressive symptoms. Some studies also show that pre and postoperative CBT interventions can promote weight loss. New applications of CBT such as by telephone, internet, or virtual reality might contribute to more accessible and low-cost treatments for the large group of bariatric patients worldwide.

Summary

CBT seems to be effective in reducing risk factors for weight regain after bariatric surgery, such as disordered eating behavior and depression. Controlled studies with long-term follow-up and larger sample sizes are needed to investigate the long-term effect of CBT interventions on weight loss results and psychological well-being.

Keywords

bariatric surgery, cognitive behavioral therapy, obesity, predictors, weight loss

INTRODUCTION

The rising prevalence of obesity in many countries has been described as a global pandemic [1]. If this trend continues, by 2025 global obesity prevalence will reach 18% in men and surpass 21% in women [2]. Obesity is defined as a BMI greater than or equal to 30 [calculated as weight (kg)/height (m²)]. Obesity is not an eating disorder according to diagnostic and statistical manual of mental disorders-5. However, it is a harmful health condition, which globally causes many more disability adjusted life years than eating disorders do [3,4]. Morbid obesity – defined as a BMI of at least 40 kg/m² – is a very serious health condition with corresponding increases in obesity-related morbidity and associated health costs [5]. Globally, the prevalence of morbid obesity is 0.64% (95% confidence interval: 0.46–0.86) in men and 1.6% (1.3–1.9) in women [2].

Bariatric surgery is the most effective treatment for morbid obesity and leads to more weight loss compared with nonsurgical treatment [6]. The majority of patients experience excess weight loss

and improvement of psychological functioning after surgery. However, 20–30% of patients experience suboptimal or adverse postoperative results such as premature weight stabilization or weight regain [7,8]. Medical comorbidities and complications after surgery can play a role in these negative outcomes. Also the type of surgical procedure influences the weight loss result [9]. Apart from these somatic and surgical factors, psychological aspects have an effect on surgery outcomes as well, such as

^aPsyQ, Parnassia Psychiatric Institute, The Hague, ^bPsyQ, Parnassia Psychiatric Institute, Rotterdam, ^cDepartment of Psychology, Education and Child Studies, Erasmus University Rotterdam, Rotterdam, ^dParnassia Psychiatric Institute, The Hague, ^eDepartment of Psychiatry, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands and ^fDepartment of Epidemiology, Columbia University Mailman School of Public Health, New York City, New York, USA

Correspondence to Linda Paul, MSc, PsyQ, Parnassia Psychiatric Institute, Lijnbaan 4, NL-2512 VA, The Hague, The Netherlands.
Tel: +31 88 357 3032; e-mail: l.paul@parnassiagroep.nl

Curr Opin Psychiatry 2017, 30:000–000

DOI:10.1097/YCO.0000000000000359

Eating disorders

KEY POINTS

- Postoperative and not preoperative behaviors predict weight loss results.
- CBT seems to be effective in reducing risk factors for weight regain after bariatric surgery, such as disordered eating behavior and depression. Whether this also promotes long-term weight loss results needs further research.
- New applications of CBT such as telephone, internet or virtual reality-based might contribute to more accessible, lower cost treatments for the large group of bariatric patients worldwide.

depressive, anxiety, and eating disorders, but also disordered eating behaviors such as emotional eating and loss of control over eating [10–14]. The addition of psychological treatment to bariatric surgery might contribute to optimizing long-term weight loss and psychological well-being by reducing psychological risk factors and promoting healthy lifestyle.

Most psychological interventions for bariatric surgery patients include behavioral life style components like healthy eating behavior and physical activity. In addition to behavioral interventions, cognitive behavioral therapy (CBT) consists of techniques to identify and modify dysfunctional thoughts. Interventions may be applied pre or postsurgery. The research field for psychological treatment in bariatric surgery patients is relatively new, so empirical support is still scarce. In a systematic review and meta-analysis of studies conducted until 2013 Rudolph and Hilbert [15] examined the effects of various postoperative behavioral lifestyle interventions, including eight studies on CBT. Their review showed that weight loss in patients in the treatment group was larger than in the usual care or no treatment groups in 13 out of 16 studies. However, because of uncontrolled study designs, small sample sizes and variety in interventions, generalizability is limited. In recent years, several randomized clinical trials (RCTs) on CBT in bariatric surgery patients have been conducted, showing promising results on reducing disordered eating behavior and promoting weight loss [16,17,18,19].

The article provides an overview of the outcomes of studies on predictors of postsurgical weight loss since 2014. Also current knowledge regarding the effectiveness of CBT in bariatric patients is outlined, as well as the development of new treatment applications.

PREDICTIVE AND RISK FACTORS

In search for predictors and risk factors for weight loss and psychological well-being after bariatric surgery various factors have been investigated. These factors concern a variety of psychiatric symptoms and disorders (e.g., depression), dysfunctional behaviors (e.g., disordered eating), presurgical weight, and variations in presurgical preparatory procedure (e.g., mandatory weight loss). Reviews from 2014 addressing predictive and risk factors will be discussed first, followed by a presentation of recent studies.

In 2014, Wimmelmann *et al.* [20] reviewed studies on psychological predictors of surgical weight loss. Results regarding the predictive value of severe binge eating appeared to be inconclusive, which could be related to differences in study design and assessment of binge eating. Personality and moderate psychiatric comorbidity were not the predictors of postsurgical weight loss, whereas cognitive impairments and severe psychiatric disorders appeared to be negative predictors of weight loss.

A review by Meany [21] of 15 studies on binge eating, binge eating disorder (BED), and loss of control over eating showed that these were associated with suboptimal outcomes in terms of less weight loss and more weight regain in the postoperative phase.

In line with these findings, a review of predictors of postoperative weight loss [14] also concluded that various postoperative disordered eating behaviors such as BED, loss of control over eating, and emotional eating were associated with poorer weight outcomes. Also, life style factors such as physical activity and adherence to postoperative diet recommendations predicted weight loss.

In the following, we will describe new studies which have been published since these reviews. In a first cross-sectional study on maladaptive eating behavior and weight loss by Conceição *et al.* [10] a group of preoperative bariatric surgery patients and two postoperative groups (respectively, <2 and >2 years postoperative) were compared. Loss of control over eating was found to be present in 26.7% of the patients in the preoperative phase, in 11.8% of patients within the first 24 months after surgery and in 16.9% of patients after 24 months. Loss of control was associated with poorest weight loss outcomes, most weight regain, highest BMI, and most psychological distress, specifically in the long run. In a second cross-sectional study by the same research group [11] a preoperative group and three postoperative groups (6 months, 1 year, 2 years postoperative) were assessed. The presence of maladaptive eating behaviors was found to increase as

time progresses after bariatric surgery, and to be associated with weight regain. This was especially true for picking and nibbling (unplanned and repetitive eating of modest amounts of food). In a longitudinal study, Conceição *et al.* [22^{***}] found that the pre and postoperative frequency of problematic eating behaviors was comparable (37.7 and 45.9%). However 43.5% of patients stopped disordered eating preoperatively. Postoperatively 39.5% of patients developed problematic eating behaviors. Whereas preoperative disordered eating was not a significant predictor for postoperative weight loss, postoperative disordered eating predicted worse weight loss outcomes.

In the Longitudinal Assessment of Bariatric Surgery-2 study Mitchell *et al.* [12] examined eating behaviors and eating disorders before bariatric surgery in a large sample of 2266 participants. Disordered eating behaviors, such as skipping breakfast and eating with a sense of loss of control were reported by 46 and 43%, respectively. Eating disorders were found in a smaller proportion of the participants: 16% of the participants reported BED and 2% bulimia nervosa. Both disordered eating behaviors and eating disorders were found to lead to increased risk of negative treatment outcomes after bariatric surgery. In a 3-year follow-up of the Longitudinal Assessment of Bariatric Surgery-2 study Mitchell *et al.* [23^{***}] found that behaviors such as eating behavior, eating problems, and weight control practices are related to weight loss differences and authors stress the importance of assessment and modification of these behaviors.

The 10-year results of the Swedish obese subjects study [24] indicated that the tendency to eat in response to various internal and external eating cues shortly after the operation predicted poorer weight loss outcomes.

In a 2-year follow-up study [25], depressive symptoms were found to initially decrease after surgery, but to reoccur as time progressed. These postoperative depressive symptoms were associated with poorer weight loss outcomes at 6 and 12 months follow-up, but did not predict weight loss at 24 months follow-up.

Devlin *et al.* [26^{*}] investigated the prevalence of pathological eating behaviors (subjective and objective binge eating episodes, loss of control, picking and nibbling, night eating) and found that these behaviors improved significantly in the pre to 1-year postsurgery and that these improvements were maintained over a 3-year postsurgery period. Consistent with other research findings they also found that postsurgical eating disease, including loss of control and hunger was associated to poorer weight loss.

Hindle *et al.* [27^{*}] reviewed 39 studies into early postoperative variables and later weight loss and found that a better early postsurgical weight loss was the most predictive factor of successful weight loss in the period up to 24 months postsurgery.

To sum up, results of studies into preoperative predictors for weight loss after bariatric surgery have been inconclusive. It appears that postoperative behaviors influence postoperative weight loss more directly than preoperative factors. Especially postsurgical disordered eating behaviors, eating disorders, and depressive symptoms have been found to be associated with less optimal weight loss results. These results highlight the importance of continuous and long-term monitoring of these risk factors and behaviors postoperatively and early intervention in case of stagnation of weight loss. Also early postoperative weight loss predicts better medium-term weight loss (<24 months).

COGNITIVE BEHAVIORAL TREATMENT AND BARIATRIC SURGERY

The study of psychological interventions in bariatric patients is only in its infancy, and has mainly focused on CBT. So far, only a few RCTs have been carried out, investigating CBT interventions delivered pre or postsurgically. Studies from 2015 will be discussed.

Gade *et al.* [16] examined a preoperative intervention among 80 bariatric patients. The treatment group received 10 sessions of CBT and the control group received nutritional support and education. The CBT intervention was focused on recognizing triggers for disordered eating and improving self-monitoring and self-control of eating behavior. The CBT group showed significant improvements compared with the control group for depression and anxiety symptoms pre and post-CBT and for depression at 1 year after surgery. Although both groups showed improvements, in the CBT group there was earlier recovery of anxiety and mood symptoms. Nonsignificant body weight differences between both groups were found 1 year postoperatively, indicating that the reduction of mood and anxiety symptoms did not affect weight loss results at 1-year follow-up.

Bond *et al.* [17,28] conducted an RCT of a preoperative behavioral intervention focused on increasing moderate-to-vigorous physical activity by self-monitoring, problem-solving skills, cognitive strategies, and homework assignments. In total, 75 participants were randomly assigned to six weekly CBT sessions or standard presurgical care consisting of routine preoperative clinic visits. Findings suggest that increasing moderate-to-vigorous

Eating disorders

physical activity contributes to physical and mental health-related quality of life preoperatively. Unfortunately, no postoperative measurement has been conducted, nor was weight loss included as outcome measure. This makes it unclear whether these results were retained after surgery and whether this intervention also improved postsurgical outcomes.

Marcon *et al.* [19] compared the relative efficacy of preoperative exercise groups with and without CBT to a control group. In total, 66 patients were randomly assigned to these three conditions. The exercise program included two weekly sessions during 4 months. In the CBT condition weekly group therapy aimed at life style modification was added to the exercise program. The control group only received routine clinic appointments and information meetings. Measurements were conducted at baseline and post-CBT. Results showed that the exercise intervention had a positive health effect including weight loss. The control group on the contrary showed an increase of medical risk factors during the waiting time for surgery. No statistically significant differences were found between the intervention groups with and without CBT.

To sum up, several studies on preoperative CBT interventions have shown positive effect on psychological well-being and weight loss, but long-term postoperative effects still need to be further examined.

Developing new treatment applications of CBT is important regarding the large number of patients and the need for long-term monitoring. Moreover, face to face treatment can be problematic because of practical barriers such as limited mobility and limited accessibility of specialized bariatric surgery centers in some countries or rural areas. To improve accessibility and cost-effective treatments, telephone, internet, and virtual reality-based applications of CBT are being examined.

A 6-week telephone-based CBT intervention was tested both pre and postsurgery [18^a,29]. In a preoperative pilot RCT [18^a], 47 patients were randomly assigned to standard preoperative care (routine clinic visits and information meetings) or six sessions of tele-CBT. The tele-CBT protocol consisted of six weekly sessions focused on psychoeducation, self-monitoring, problem-solving, and goal setting [30]. Although the control group showed a small increase in binge eating and emotional eating at postintervention, the CBT group experienced statistically significant improvements with large effect sizes in eating behaviors and psychological well-being. In a postoperative uncontrolled pilot study [29], 19 patients received 6-months postoperative six sessions of the same tele-CBT. Results showed significant reductions in binge eating, emotional

eating, and mood and anxiety symptoms at posttreatment.

The online and smartphone application of CBT is currently being investigated in Canada and Portugal [31,32]. These programs may contain a CBT-based self-help manual and psychoeducation, a feedback messaging system, and scheduled chat sessions with a psychologist and are aimed at training relevant skills in the postoperative period, promoting important health behaviors, improving compliance to life style adjustments, and early detection of risk behaviors. Efficacy results are not available yet.

A final recent and innovative application of CBT is virtual reality-enhanced CBT [33^a]. Although not investigated for bariatric surgery patients yet, results of a preliminary RCT comparing CBT, virtual reality-enhanced CBT, and the standard behavioral program among 163-female patients with morbid obesity were promising regarding weight loss. CBT consisted of a 1-week inpatient program followed by five weekly group sessions and 10 biweekly individual sessions. The virtual reality-enhanced CBT group received the same program as the CBT group but instead of 10 biweekly individual sessions, 10 biweekly virtual reality sessions were offered. In 14 high risk virtual environments, like a supermarket or restaurant, patients directly practiced coping, decision-making, and problem-solving skills. Significant weight loss was achieved in all three groups. No significant differences between the three groups were found at posttreatment assessment, but the virtual reality-enhanced CBT had a greater probability of maintaining or improving weight loss at 1-year follow-up.

Worth mentioning is a case series of three gastric band surgery patients receiving a 6-week virtual reality CBT protocol aimed at improving body image disorders and weight loss [34]. The CBT consisted of five group sessions focused on improving motivation to change and assertiveness and 10 biweekly virtual reality sessions identical to the virtual reality intervention mentioned above. Post-treatment results showed 15–20% further weight reduction, apart from reduction of body dissatisfaction, anxiety, and bulimic behaviors. Currently these researchers are conducting an RCT.

In addition to the development of both pre and postoperative CBT packages for optimizing results of bariatric surgery, in the past 3 years, several postoperative CBT interventions were specifically developed for patients experiencing postoperative weight regain. So far, those treatments have only been examined in pilot studies, so no definitive conclusions regarding their efficacy can be drawn.

In a pilot study [35], pre and post-CBT results of a 6-week group intervention based on CBT and dialectical behavior therapy principles for 28 patients experiencing postoperative weight regain showed statistically significant improvements for depressive symptoms, subjective binge eating, grazing, and weight loss. Treatment included self-monitoring, stress management, and diet skills as well as interventions for preventing emotion dysregulation and changing disordered eating.

Beaulac and Sandre [36] examined the efficacy of an 8-week postsurgical CBT group among 17 patients experiencing difficulties in weight loss and adjustment to postoperative status in a comparable pilot study. Patients were assisted in developing coping strategies for managing stress and conflicts, and in becoming more aware of triggers for negative moods. Results showed improvements in well-being and a decrease of psychological symptoms and distress, although statistically not significant.

Robinson *et al.* [37^{***}] examined a skills-based postoperative intervention aimed at improving dietary adherence among 22 postoperative patients at high risk for suboptimal weight loss outcomes. Psychological skills deficits associated with suboptimal weight loss outcomes, such as a lack of self-monitoring and assertiveness, are assessed and trained.

CONCLUSION

Research focused on identifying predictors for weight loss after bariatric surgery has shown that post rather than preoperative behaviors predict postoperative weight loss. Especially postsurgical disordered eating behaviors, eating disorders, and psychopathology have been found to be associated with less optimal weight loss results. This highlights the importance of continuous and long-term monitoring of these risk factors and behaviors postoperatively and early intervention in case of stagnation of weight loss.

Although empirical evidence is still scarce results show that CBT is effective in reducing disordered eating behavior and depression in bariatric patients. Most studies conducted so far lack long-term follow-ups, lack important outcome variables (e.g., only weight loss and no psychological variables or vice versa) and were uncontrolled or had small sample sizes. Also the relationship between reduction of risk factors by CBT and long-term weight loss results need further research. Longitudinal controlled studies with larger samples are needed to examine the long-term effects of CBT on weight loss and psychological well-being.

Currently, a longitudinal RCT in 128 patients on the effects of CBT, with follow-ups at 1, 3, and 5-years postsurgery, is being conducted by the authors [38].

New techniques for applying CBT by telephone, internet, or virtual reality potentially make CBT more accessible and less costly, meeting the needs of treating a large number of patients worldwide and for long-term postoperative monitoring of patients.

Acknowledgements

None.

Financial support and sponsorship

None.

Conflicts of interest

There are no conflicts of interest.

REFERENCES AND RECOMMENDED READING

Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
- of outstanding interest

1. Ng M, Fleming T, Robinson M, *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. *Lancet* 2014; 384:766–781.
2. NCD Risk Factor Collaboration (NCD-RisC). Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants. *Lancet* 2016; 387:1377–1396.
3. Lim SS, Vos T, Flaxman AD, *et al.* A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2013; 380:2224–2260.
4. Erskine HE, Whiteford HA, Pike KM. The global burden of eating disorders. *Curr Opin Psychiatry* 2016; 29:346–353.
5. Marcus MD, Wildes JE. Disordered eating in obese individuals. *Curr Opin Psychiatry* 2014; 27:443–447.
6. Gloy VL, Briel M, Bhatt DL, *et al.* Bariatric surgery versus nonsurgical treatment for obesity: a systematic review and meta-analysis of randomized controlled trials. *BMJ* 2013; 347:f5934.
7. Adams TD, Davidson LE, Litwin SE, *et al.* Health benefits of gastric bypass surgery after 6 years. *JAMA* 2012; 308:1122–1131.
8. Courcoulas AP, Christian NJ, Belle SH, *et al.* Longitudinal Assessment of Bariatric Surgery (LABS) Consortium. Weight change and health outcomes at 3 years after bariatric surgery among individuals with severe obesity. *JAMA* 2013; 310:2416–2425.
9. Zhang Y, Wang J, Sun X, *et al.* Laparoscopic sleeve gastrectomy versus laparoscopic Roux-en-Y gastric bypass for morbid obesity and related comorbidities: a meta-analysis of 21 studies. *Obes Surg* 2015; 25:19–26.
10. Conceição E, Pinto-Bastos A, Brandão I, *et al.* Loss of control eating and weight outcomes after bariatric surgery: a study with a Portuguese sample. *Eat Weight Disord* 2014; 19:103–109.
11. Conceição E, Mitchell JE, Vaz AR, *et al.* The presence of maladaptive eating behaviors after bariatric surgery in a cross sectional study: importance of picking or nibbling on weight regain. *Eat Behav* 2014; 15:558–562.
12. Mitchell JE, King WC, Courcoulas A, *et al.* Eating behavior and eating disorders in adults before bariatric surgery. *Int J Eat Disord* 2014; 48: 215–222.
13. Green DD, Engel SG, Mitchell JE. Psychological aspects of bariatric surgery. *Curr Opin Psychiatry* 2014; 27:448–452.
14. Sheets CS, Peat CM, Berg KC, *et al.* Post-operative psychosocial predictors of outcome in bariatric surgery. *Obes Surg* 2015; 25:330–345.
15. Rudolph A, Hilbert A. Post-operative behavioural management in bariatric surgery: a systematic review and meta-analysis of randomized controlled trials. *Obes Rev* 2013; 14:292–302.

Eating disorders

16. Gade H, Friberg O, Rosenvinge JH, *et al.* 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* 2015; 25:2112–2119.
17. Bond DS, Vithianathan S, Thomas JG, *et al.* Bari-active: a randomized controlled trial of a preoperative intervention to increase physical activity in bariatric surgery patients. *Surg Obes Relat Dis* 2015; 11:169–177.
18. Cassin SE, Sockalingam S, Du C, *et al.* A pilot randomized controlled trial of telephone-based cognitive behavioural therapy for preoperative bariatric surgery patients. *Behav Res Ther* 2016; 80:17–22.
The controlled pilot study provides preliminary evidence for improving eating psychopathology and depression in bariatric surgery candidates by using telephone-based CBT.
19. Marcon ER, Baglioni S, Bittencourt L, *et al.* What is the best treatment before bariatric surgery? Exercise, exercise and group therapy, or conventional waiting: a randomized controlled trial. *Obes Surg* 2017; 27:763–773.
20. Wimmelmann CL, Dela F, Mortensen EL. Psychological predictors of weight loss after bariatric surgery: a review of the recent research. *Obes Res Clin Pract* 2014; 8:e299–e313.
21. Meany G, Conceição E, Mitchell JE. Binge eating, binge eating disorder and loss of control eating: effects on weight outcomes after bariatric surgery. *Eur Eat Disord Rev* 2014; 22:87–91.
22. Conceição EM, Mitchell JE, Pinto-Bastos A, *et al.* Stability of problematic eating behaviors and weight loss trajectories after bariatric surgery: a longitudinal observational study. *Surg Obes Relat Dis* 2017; 13:1063–1070.
The longitudinal study shows that preoperative problematic eating behavior is not a significant predictor for postsurgical weight loss. Postoperative problematic eating behavior is a significant predictor of different weight loss trajectories after bariatric surgery.
23. Mitchell JE, Christian NJ, Flum DR, *et al.* Postoperative behavioral variables and weight change 3 years after bariatric surgery. *JAMA Surg* 2016; 151:752–757.
The longitudinal cohort study shows that postoperative eating and weight control behaviors, many of which are potentially modifiable, may improve weight loss substantially following bariatric surgery.
24. Konttinen H, Peltonen M, Sjöström L, *et al.* Psychological aspects of eating behavior as predictors of 10-y weight changes after surgical and conventional treatment of severe obesity: results from the Swedish obese subjects intervention study. *Am J Clin Nutr* 2015; 101:16–24.
25. White MA, Kalarchian MA, Levine MD, *et al.* Prognostic significance of depressive symptoms on weight loss and psychosocial outcomes following gastric bypass surgery: a prospective 24-month follow-up study. *Obes Surg* 2015; 25:1909–1916.
26. Devlin MJ, King WC, Kalarchian MA, *et al.* Eating pathology and experience and weight loss in a prospective study of bariatric surgery patients: 3-year follow-up. *Int J Eat Disord* 2016; 49:1058–1067.
The prospective study shows that postoperative loss of control eating, hunger and eating disease (also BED) are related to less weight loss.
27. Hindle A, de la Piedad Garcia X, Brennan L. Early postoperative psychosocial and weight predictors of later outcome in bariatric surgery: a systematic literature review. *Obes Rev* 2017; 18:317–334.
This is the first systematic review regarding early postoperative variables predictive of later weight and psychosocial outcomes in bariatric surgery showing that early weight loss trajectory is the most consistent predictor of more successful medium-term weight outcome.
28. Bond DS, Thomas JG, King WC, *et al.* Exercise improves quality of life in bariatric surgery candidates: Results from the Bari-Active trial. *Obesity (Silver Spring)* 2015; 23:536–542.
29. Sockalingam S, Cassin SE, Wnuk S, *et al.* A pilot study on telephone cognitive behavioral therapy for patients six-months post-bariatric surgery. *Obes Surg* 2016; 26:1–6.
30. Cassin SE, Sockalingam S, Wnuk S, *et al.* Cognitive behavioral therapy for bariatric surgery patients: preliminary evidence for feasibility, acceptability, and effectiveness. *Cogn Behav Pract* 2013; 20:529–543.
31. Zhang MW, Ho RC, Cassin SE, *et al.* Online and smartphone based cognitive behavioral therapy for bariatric surgery patients: initial pilot study. *Technol Health Care* 2015; 23:737–744.
32. Conceição EM, Machado PP, Vaz AR, *et al.* APOLO-Bari, an internet-based program for longitudinal support of bariatric surgery patients: study protocol for a randomized controlled trial. *Trials* 2016; 17:114.
33. Manzoni GM, Cesa GL, Bacchetta M, *et al.* Virtual reality-enhanced cognitive-behavioral therapy for morbid obesity: a randomized controlled study with 1 year follow-up. *Cyberpsychol Behav Soc Netw* 2016; 19:134–140.
This is the first controlled study using virtual reality-enhanced CBT for patients with morbid obesity showing that virtual reality-enhanced CBT is effective in further improving weight loss at 1 year.
34. Cárdenas-López G, Torres-Villalobos G, Martínez P, *et al.* Virtual reality for improving body image disorders and weight loss after gastric band surgery: a case series. *Stud Health Technol Inform* 2014; 196:43–47.
35. Himes SM, Grothe KB, Clark MM, *et al.* Stop regain: a pilot psychological intervention for bariatric patients experiencing weight regain. *Obes Surg* 2015; 25:922–927.
36. Beaulac J, Sandre D. Impact of a CBT psychotherapy group on postoperative bariatric patients. *Springerplus* 2015; 4:764.
37. Robinson AH, Adler S, Darcy AM, *et al.* Early Adherence Targeted Therapy (EATT) for postbariatric maladaptive eating behaviors. *Cogn Behav Pract* 2016; 23:548–560.
Early adherence targeted therapy is a new intervention for postoperative patients at risk of poor weight loss outcomes and this pilot study shows preliminary positive outcomes.
38. Paul L, van Rongen S, van Hoeken D, *et al.* Does cognitive behavioral therapy strengthen the effect of bariatric surgery for obesity? Design and methods of a randomized and controlled study. *Contemp Clin Trials* 2015; 42:252–256.