Obesity Research & Clinical Practice 13 (2019) 499–504

Contents lists available at ScienceDirect

Obesity Research & Clinical Practice

journal homepage: www.elsevier.com/locate/orcp

# Telephone-based cognitive behavioural therapy for female patients 1-year post-bariatric surgery: A pilot study

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ARTICLE INFO

*Article history:*
Received 5 March 2019
Received in revised form 29 June 2019
Accepted 26 July 2019

*Keywords:*
Bariatric surgery
Cognitive behavioural therapy
Disordered eating
Telephone therapy
Telepsychology

ABSTRACT

*Objective:* Although bariatric surgery is a durable treatment for patients with severe obesity, it does not directly address behavioural and psychological factors that potentially contribute to weight regain post-surgery. Psychological interventions, such as cognitive behavioural therapy (CBT), can be challenging to access due to physical limitations and practical barriers. Telephone-based CBT (Tele-CBT) can improve eating psychopathology and psychological distress before and after surgery. Given the frequent occurrence/recurrence of problematic eating-related and psychological issues many patients face 1-year post-surgery, this open-trial pilot study aimed to evaluate the effectiveness of Tele-CBT delivered 1-year post-surgery as an adjunctive treatment to the usual standard of bariatric care.
*Methods:* Patients ($n = 43$) received six 1-h Tele-CBT sessions delivered weekly beginning at 1-year post-surgery. Patients completed questionnaire packages before and after the intervention to assess changes in binge eating (BES), emotional eating (EES), depression (PHQ-9), and anxiety (GAD-7).
*Results:* Thirty-two patients completed Tele-CBT yielding a 74.4% completion rate. Participants reported significant improvements on the Binge Eating Scale ($t(31) = 3.794$, $p = 0.001$), Emotional Eating Scale ($t(31) = 3.508$, $p = 0.001$), Patient Health Questionnaire-9 Item Scale ($z = -2.371$, $p = 0.018$), and Generalised Anxiety Disorder-7 Item Scale ($z = -3.546$, $p < 0.001$) immediately following Tele-CBT.
*Discussion:* The results demonstrate that Tele-CBT delivered 1-year post-surgery may improve binge eating, emotional eating, depression, and anxiety. Additional research is warranted to examine whether these changes translate into long-term improvements in bariatric surgery outcomes.


## Introduction

With global increases in the prevalence of overweight and obesity expected to reach 2.16 billion people by 2030, there is increasing need for treatments with long-term effectiveness across the obesity severity continuum [1]. Obesity is associated with significant medical comorbidities and has a high rate of mortality [2–4]. Bariatric surgery is the most durable treatment for individuals with class II and III obesity (body mass index > 35 kg/m$^2$), with studies demonstrating significant improvements in weight loss and quality of life, and resolution of obesity-related comorbidities such as diabetes mellitus [5–7]. Despite these benefits, studies suggest that a proportion of patients may not achieve expected weight loss and may experience weight regain beyond the first year after bariatric surgery. In the Swedish Obesity Subjects study, 9% of patients who underwent gastric bypass surgery lost less than 5% of their weight at 10-years post-surgery [7]. Moreover, three-year data from the Longitudinal Assessment of Bariatric Surgery study in the United States reported that 24% of patients who underwent

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https://doi.org/10.1016/j.orcp.2019.07.003
1871-403X/

gastric bypass surgery had considerable weight regain relative to their overall weight loss, and patients' weight trajectories began to diverge at 1-year post-surgery [8].

Weight regain may be due to several factors including disordered eating and psychological distress. The relationship between psychological stress and obesity is complex, as this relationship is often formed during childhood due to a strong biological linkage [9]. Psychological stress can increase leptin resistance [10], levels of neuropeptide Y [11] and inflammatory cytokines [12] which causes an increase in appetite and body weight. Several studies have associated post-surgery loss of control over eating, binge eating, and depression with poorer weight loss outcomes [13–15]. Devlin and colleagues assessed eating psychopathology prior to bariatric surgery and annually post-surgery for a total of 3 years. Despite sustained improvements in subjective bulimic episodes, loss of control over eating, night eating, and other eating psychopathology until 3 years post-surgery, post-bariatric surgery eating psychopathology (as measured by the Eating Disorder Examination global score), hunger and monthly loss of control over eating were associated with significantly worse weight loss outcomes. This finding is congruent with additional data demonstrating that post-bariatric surgery binge eating disorder, albeit less common, was associated with poor weight loss outcomes [16]. In contrast, data from the Toronto Bari-PSYCH cohort demonstrated a gradual increase in binge eating symptoms and emotional eating between years 1 and 3 post-bariatric surgery [15]. Moreover, greater binge eating symptoms (albeit sub-clinical) at 1-year post-bariatric surgery were associated with poorer weight loss outcomes at 2-years after bariatric surgery. Therefore, these studies highlight the impact of early post-operative eating psychopathology, specifically binge eating symptoms, on long-term eating psychopathology and weight loss outcomes after bariatric surgery.

Given the salience of eating psychopathology on weight loss outcomes after bariatric surgery, several studies have explored the effectiveness of psychological interventions, such as cognitive behavioral therapy (CBT), in both individual and group format [17,18]. Systematic reviews and meta-analyses synthesizing data from studies examining the efficacy of behavioural and psychotherapeutic interventions before and after surgery have shown that these interventions lead to greater weight loss post-bariatric surgery [19–21]. More recent reviews have re-evaluated psychological treatment studies in this patient population and have concluded that available data favour post-surgery over pre-surgery psychosocial interventions to support weight loss trajectories and improve patient functioning and quality of life [22]. More specifically, 1-year post-bariatric surgery appears to be a challenging time for many patients, indicating that this time point may be most suitable for delivering psychosocial interventions as a maintenance approach to preventing weight regain [23,24]. Longitudinal research has shown that patients typically experience rapid weight loss during the first 6 months following surgery with little effort [23,24] and during this "honeymoon period", have little incentive to engage in psychosocial interventions. In addition, 1-year post-op was selected because patients have not yet entered the high-risk period for weight regain that typically occurs 1.5 to 2 years following surgery [23,24].

Previous studies have advocated for the need to develop technology-based interventions to increase treatment accessibility [25]. Bariatric patients, in particular, face issues such as far travel distances to bariatric surgery programs and mobility challenges secondary to obesity that make attending weekly in-person sessions unfeasible [26,27]. Given the demonstrated efficacy of CBT for treating binge eating in patients with obesity [18], several trials have studied the efficacy of telephone-based CBT (Tele-CBT) for treating eating psychopathology in the context of bariatric surgery [28–30]. CBT incorporates both behavioural interventions (e.g., food monitoring, weekly weighing goal setting, behavioural activation, stimulus control, environmental contingencies) and cognitive interventions (e.g., identifying, challenging, and altering counterproductive thoughts). Following an initial feasibility pilot study, a randomised controlled trial compared the efficacy of pre-surgery Tele-CBT to a waitlist control and demonstrated greater improvements in the Tele-CBT group and large treatment effect sizes for binge eating, emotional eating, and psychological distress [29]. Similarly, a follow-up open-trial examining Tele-CBT delivered at 6-months post-bariatric surgery also showed large effect sizes for improvements in binge eating, emotional eating, and psychological distress after completing the intervention [30].

The current open-trial pilot study sought to build upon the existing Tele-CBT research by evaluating the effectiveness of a Tele-CBT intervention delivered 1-year post-bariatric surgery. This period was selected as a result of the above literature highlighting patient challenges emerging around this critical time, as well as unpublished qualitative data on patients' preferences for when to receive Tele-CBT [31]. Although it is common to identify early increases in symptomatology as a risk factor for weight regain [15,16], it may also be possible that many patients are sub-syndromal early on in the post-operative period making eating psychopathology difficult to detect due to small magnitudes of symptom score changes. Therefore, the aim of this study was to evaluate the effects of a Tele-CBT intervention delivered at 1-year post-bariatric surgery on binge eating, emotional eating, depression, and anxiety symptoms. We hypothesised that both participants with early symptomatology (i.e., those who are at a higher risk for weight regain) as well as those who may be still sub-syndromal would equally benefit from efficient, accessible short-term Tele-CBT by improving depressive symptoms, anxiety and eating psychopathology.

## Methods

### *Participants*

Adult patients ($n = 43$) were recruited from the Toronto Western Hospital Bariatric Surgery Program (TWH-BSP), which is a Bariatric Surgery Centre of Excellence. Patients were eligible to participate in the study if they were 1-year post-bariatric surgery, fluent in English, and had access to a telephone and a computer with Internet connection to complete the questionnaires. Study exclusion criteria included active suicidal ideation and poorly controlled psychiatric illness that would preclude engaging in Tele-CBT (e.g., psychosis). All patients underwent Roux-en-Y gastric bypass surgery unless a sleeve gastrectomy was surgically indicated. Given that the Tele-CBT protocol focuses on teaching coping skills to help maintain progress following bariatric surgery, all patients at 1-year post-bariatric surgery who met the inclusion criteria were eligible for the study regardless of whether they reported elevated scores on eating pathology, depression, or anxiety at baseline.

### *Procedure*

Ethics approval for the study was obtained from the University Health Network Research Ethics Board (CAPCR ID: 11-0622.14). Patients were recruited during their routine clinical follow-up appointments. Recruitment occurred over a period of 21 months. All patients provided informed consent in order to be screened for the study and completed questionnaires online at baseline and following the Tele-CBT intervention using Qualtrics (Provo, UT). The total time interval between the baseline and post-treatment questionnaires was 7 weeks.

The Tele-CBT intervention consisted of six weekly 1-h sessions, scheduled at a time convenient for the participant. Two doctoral

**Table 1**
Overview of Tele-CBT session content.

| Session | Content |
|---|---|
| 1 | • Introduction to CBT<br>• Treatment goal setting<br>• Psychoeducation regarding the CBT model |
| 2 | • Rationale for developing a regular pattern of eating and using stimulus control to improve eating habits<br>• Self-monitoring: daily food records<br>• Rationale for developing a regular pattern weighing<br>• Self-monitoring: weekly weighing<br>• Responding to comments from others regarding weight |
| 3 | • Psychoeducation regarding the emotion regulation functions of eating<br>• Rationale for planning pleasurable and self-care activities and activities incompatible with eating<br>• Developing list of pleasurable and self-care activities |
| 4 | • Planning for challenging eating situations<br>• Identifying and challenging maladaptive thoughts using thought records |
| 5 | • Problem-solving<br>• Body image and body checking behaviours |
| 6 | • Sustaining long-term lifestyle changes<br>• Revisiting treating goals<br>• Relapse prevention |

students in clinical psychology with experience in the assessment and treatment of bariatric surgery patients conducted the sessions, and they received clinical supervision from the last author. In brief, the Tele-CBT intervention focused on introducing a personalised cognitive behavioural model of overeating and obesity to participants. Themes and topics discussed include the importance of scheduling healthy meals and snacks at regular time intervals, planning pleasurable activities as an alternative to overeating, identifying and planning for difficult eating scenarios, and reducing vulnerability to overeating by challenging negative thoughts and solving problems. Participants were expected to complete homework between sessions including various worksheets (e.g., food records, thought records, problem-solving skills), and putting into practice skills taught during the session (e.g., engaging in self-care and pleasurable activities) (see full Tele-CBT protocol description and Table 1) [18].

### *Measures*

Eating psychopathology was assessed using the Binge Eating Scale (BES) [32] and the Emotional Eating Scale (EES) [33]. The BES is a 16-item self-report measure designed specifically for use with individuals with obesity that assesses the presence of binge eating characteristics indicative of an eating disorder. Scores on the BES range from 0 to 46, and moderate and severe levels of binge eating correspond to cut-off scores of 18 and 27, respectively. The EES is a 25-item self-report measure that assesses a person's tendency to cope with negative affect through eating. Participants are asked to rate the strength of their urge to eat on a scale of 0 (no desire) to 4 (overwhelming urge) in response to the 25 emotions presented in the questionnaire. The EES is comprised of 3 subscales reflecting eating in response to anger/frustration, anxiety, and depression. Both the BES and EES have been studied in bariatric surgery patient populations [15,32,33].

Psychological distress was assessed using the Patient Health Questionnaire 9-Item scale (PHQ-9) [34] and the Generalised Anxiety Disorder 7-Item scale (GAD-7) [35]. The PHQ-9 is a 9-item self-report questionnaire measuring depressive symptoms on a scale ranging from 0 (not at all) to 3 (nearly every day). Scores on the PHQ-9 range from 0 to 27 with mild, moderate, moderately severe, and severe levels of depressive symptoms corresponding to cut-off scores of 5, 10, 15, and 20, respectively. The GAD-7 consists of 7-items assessing anxiety symptoms using a scale ranging from 0 (not at all) to 3 (nearly every day). Scores on the GAD-7 range from 0 to 21 with mild, moderate, and severe levels of anxiety symptoms corresponding to cut-off scores of 5, 10, and 15, respectively. Both the PHQ-9 and GAD-7 have been used in bariatric surgery populations to assess changes in psychological distress [36,37].

### *Statistical analysis*

All data analyses were performed using SPSS Statistics for Windows (Version 23.0; SPSS, IBM Corp., Armonk, NY). Descriptive statistics including means, standard deviations, and frequency counts were calculated to describe participant characteristics. Change scores were calculated by comparing session 6 (post-treatment) to baseline (pre-treatment) scores. The Shapiro–Wilk test was used to determine whether or not the data were normally distributed. A paired *t*-test was performed for clinical variables with normally distributed data and a Wilcoxon Signed-Rank test was performed for clinical variables with non-normally distributed data to determine differences before and after the Tele-CBT intervention. Pearson's r effect size was computed for all clinical variables to report the magnitude of the Tele-CBT effect. A Pearson's r effect size of 0.1 corresponds to a small effect, 0.3 a medium effect, and 0.5 a large effect [38]. A post-hoc power analysis performed using G*Power (Version 3.1.9.2; Franz Faul, Universität Kiel, Germany) determined that our sample of 32 patients achieved 77.5% power (5% significance level, two-sided).

## Results

### *Participant flow and characteristics*

The CONSORT diagram presented in Fig. 1 outlines participant flow for this study. Of the 45 participants who consented to participate in this study, 43 completed screening and commenced Tele-CBT 1-year post-bariatric surgery. One of the remaining two individuals did not respond to phone calls or emails, and the other individual chose not to receive Tele-CBT as they were already engaged in therapy with a private-practice psychologist. Of the 43 participants who commenced Tele-CBT, 11 withdrew for a variety of reasons, including time constraints ($n = 6$), personal life stressors ($n = 2$), or other reasons (i.e., not responding to calls, not find-

**Table 2**
Participant demographics ($n = 32$).

| Variable | M (SD) or n (%) |
|---|---|
| Age (years) | 49.66 (9.29) |
| Gender (female) | 32 (100%) |
| Race/ethnicity | |
| Black | 1 (2.7%) |
| East Asian | 1 (2.7%) |
| Latin American | 1 (2.7%) |
| South Asian | 1 (2.7%) |
| White (Caucasian) | 28 (85.2%) |
| Relationship Status | |
| Married/common-law | 17 (45.9%) |
| Divorced/separated | 3 (8.1%) |
| Single | 11 (29.7%) |
| Widowed | 1 (2.7%) |
| Occupational status | |
| Full-time | 21 (56.8%) |
| Part-time | 2 (5.4%) |
| Retired | 4 (10.8%) |
| Disability | (8.1%) |
| Education | |
| High school graduate | 3 (8.1%) |
| Some college/university | 6 (16.2%) |
| College or university graduate | 23 (62.2%) |

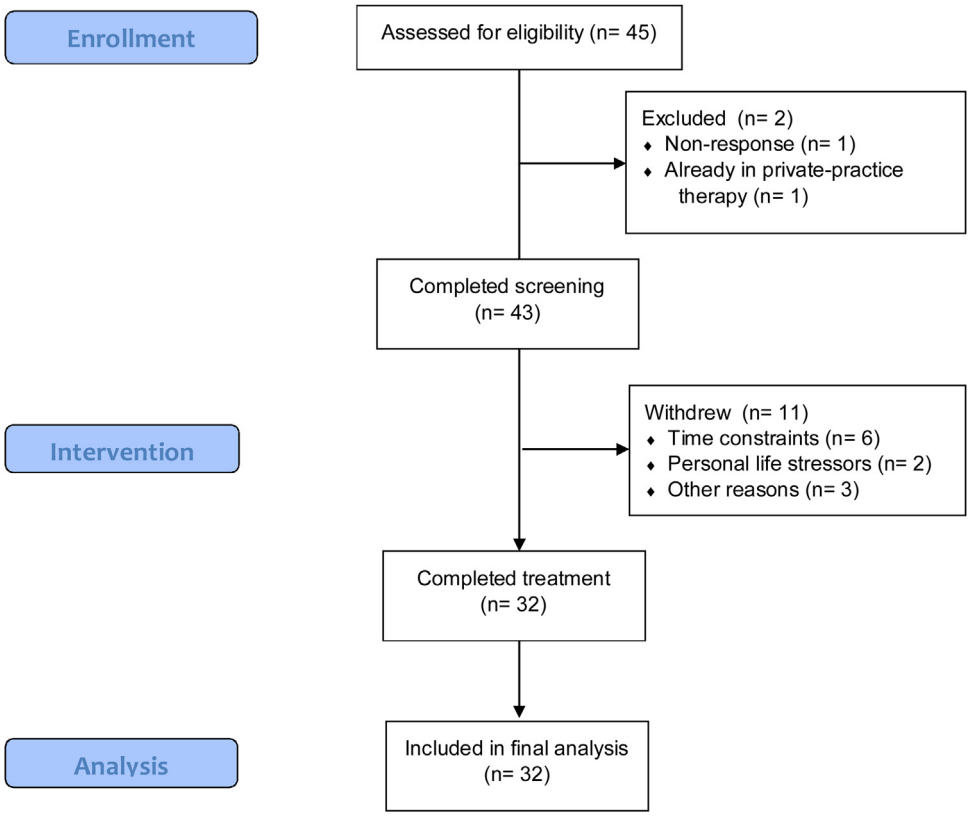


**Fig. 1.** CONSORT diagram of participant flow.

ing therapy helpful; n = 3). Given that this was a pilot study, the data analyses were conducted with study completers only ($n = 32$; 74.4% completion rate). The mean age of Tele-CBT completers was 49.66 ± 9.29 years. All 32 (100%) completers were female, 28 (87.5%) were Caucasian, 17 (53.1%) were in a relationship, 21 (65.6%) were employed full-time, and 23 (71.9%) graduated from college or university (see Table 2).

*Improvements in disordered eating and psychological distress following Tele-CBT delivered 1-year post-bariatric surgery*

Participants' scores improved on all measures following completion of the Tele-CBT intervention (see Table 3). Specifically, they reported a statistically significant reduction in scores on the BES, EES-Total, EES-Anger, EES-Depression PHQ-9, and GAD-7 following Tele-CBT. The improvement was not statistically significant for the EES-Anxiety subscale. Comparing participants' baseline measure scores to wider 1-year post-surgery bariatric population data obtained from the TWH-BSP, it was found that participants in the current study scored higher on all measures (PHQ-9: $n = 908$, M = 3.43, SD = 4.21 compared to $n = 32$, M = 12.44, SD = 4.98; GAD-7: $n = 940$, M = 2.62, SD = 3.92 compared to $n = 32$, M = 13.37, SD = 5.77; BES: $n = 755$, M = 6.21, SD = 6.20 compared to $n = 32$, M = 13.59, SD = 7.97; EES-Total: $n = 803$, M = 37.29, SD = 15.47 compared to $n = 32$, M = 55.50, SD = 23.09; EES-Anger: $n = 830$, M = 15.59, SD = 7.05 compared to $n = 32$, M = 23.41, SD = 11.63; EES-Anxiety: $n = 858$, M = 13.12, SD = 5.40 compared to $n = 32$, M = 18.63, SD = 7.79; EES-Depression: $n = 867$, M = 8.80, SD = 4.12 compared to $n = 32$, M = 13.47, SD = 5.12).

Of the 32 completers, 9 participants (28.1%) scored above the BES cut-off of 18 for clinically significant binge eating prior to Tele-CBT, and this number reduced to 4 participants (12.5%) following Tele-CBT. Additionally, 25 (78.1%) participants had clinically significant PHQ-9 scores at baseline compared to 23 (71.9%) following Tele-CBT and 24 (75%) participants had clinically significant GAD-7 scores at baseline compared to only 9 (28.1%) participants following Tele-CBT, with clinically meaningful change measured as a reduction of PHQ-9 and GAD-7 scores to less than 10.

## Discussion

An accumulating body of research indicates that bariatric surgery patients benefit significantly from Tele-CBT. Previous research has shown that patients report significant improvements in eating psychopathology and psychological distress, specifically anxiety and depressive symptoms, following Tele-CBT delivered pre-operatively [29] or 6-months post-operatively [39]. The current study adds to this literature by showing that patients who receive Tele-CBT 12-months post-surgery — a time period when bariatric patients are at elevated risk for the re-emergence of disordered eating and psychological distress — also report improvements in binge eating, emotional eating, depressive symptoms, and anxiety symptoms immediately following six sessions of Tele-CBT.

The treatment completion rate of 74.4% in the current study is higher than our previous study on Tele-CBT delivered pre-operatively (69.5%) [29] and comparable to our previous study on Tele-CBT delivered 6 months post-op (73.7%) [30]. In a study examining patient preferences regarding the timing of Tele-CBT, patients reported a clear preference for Tele-CBT delivered 1 year post-operatively (95% felt that it would be helpful to receive Tele-CBT 1 year post-operatively, whereas 60% felt Tele-CBT would be helpful 6 months post-operatively and 50% felt it would be helpful pre-operatively) [31]. Interestingly, of patients who were randomly assigned to receive Tele-CBT 6-months post-operatively in our previous study, 21% withdrew from the study prior to starting Tele-CBT because they felt they were not in need of treatment, whereas all

**Table 3**
Changes in binge eating, emotional eating, anxiety, and depression scores from pre-to-post-treatment.

| Measure | Pre-treatment | Post- treatment | Mean difference ± SD | Z | *P* value | Effect size |
|---|---|---|---|---|---|---|
| PHQ-9 | 12.44 | 9.00 | – | −2.371 | 0.018* | 0.296 |
| GAD-7 | 13.37 | 5.50 | – | −3.546 | <0.005* | 0.474 |
| BES | 13.59 ± 7.97 | 9.91 ± 6.87 | 3.688 ± 5.497 | – | 0.001* | 0.241 |
| EES Total | 55.50 ± 23.09 | 49.31 ± 25.34 | 6.19 ± 11.721 | – | 0.005* | 0.127 |
| EES-Anger | 23.41 | 20.63 | – | −2.292 | 0.022* | 0.287 |
| EES-Anxiety | 18.63 | 17.166 | – | −1.820 | 0.092 | 0.211 |
| EES-Depression | 13.47 | 11.53 | – | −3.348 | 0.001* | 0.419 |

*Note*: PHQ-9 = Patient Health Questionnaire 9-Item; GAD-7 = Generalised Anxiety Disorder Scale 7-Item; BES = Binge Eating Scale; EES = Emotional Eating Scale. Effect sizes for Pearson's *r*: 0.1 = small effect size; 03 = medium effect size; 0.5 = large effect size. Z-scores are listed for non-parametric tests.
* $p < 0.05$.

eligible participants in the current study choose to start CBT. Collectively, these findings suggest that patients have a preference to receive Tele-CBT 12-months post-operatively, a time when initial improvements in eating behaviours and psychological distress that occur following surgery typically begin to dissipate.

Patients' ability to access remotely delivered CBT is critical given that longer travel distance predicts poorer post-operative appointment attendance [40]. Given that eating psychopathology at 1-year post-surgery predicts poorer weight loss and persistent eating psychopathology [26,27,41], it is important that patients be able to access treatments remotely in order to increase their adherence to bariatric surgery aftercare. Moreover this study, along with findings from previous research, supports Tele-CBT as a psychosocial intervention to reduce eating psychopathology relatively early during the post-operative period. Further research into the effect of Tele-CBT as a potential tool to mitigate weight regain is warranted.

The study findings should be considered within the following limitations, many of which have implications for the generalizability of the results First, the sample size was quite small in this pilot study, and the participants were 100% female (despite males also being eligible to participate) and predominantly white, well-educated and employed. However, most large bariatric trials to date have included patients who are predominantly female (80%), white (87%) and employed (63%) [42] and this is therefore a broader limitation in bariatric surgery-related research that warrants further exploration in future studies. Second, patients who choose to participate in the study were more symptomatic at baseline compared to the wider population of 1-year post-op patients. Although this group difference impacts the generalizability of the findings, it is also informative because it suggests that patients who are more symptomatic are more likely to seek treatment. Third, eleven participants (25.6%) withdrew from this study and the analyses were performed amongst completers only given that it was a pilot study. Fourth, the study was an open-trial without a control group and it is possible that improvements that occurred during the treatment period could be attributed to factors other than Tele-CBT. It is worth noting that eating psychopathology and psychological distress typically worsen around this 1-year post-operative period [23,24]. Fifth, improvements were assessed immediately following treatment so it is uncertain whether the improvements were maintained over time and whether they translated into improved surgical outcomes. Further research is required to evaluate other methods to engage patients in addition to telephone (e.g. combination of telephone and online CBT) [43]. These limitations are currently being addressed in a multisite randomised controlled trial.

## Conclusion

In summary, this study adds to the existing literature supporting the effectiveness of a six-session Tele-CBT measured immediately post-final therapy session for improving symptoms of binge eating, emotional eating, depression, and anxiety among bariatric surgery patients. Tele-CBT delivered 1-year following bariatric surgery appears to be an optimal time for psychosocial intervention because it is a high-risk period for symptoms of eating pathology and psychological distress to re-emerge, and previous research report patient preference for treatment at this time. Future research examining long-term outcomes following Tele-CBT, as well as other interventions that increase treatment accessibility among bariatric patients, is warranted.

## Funding source

This study was funded by the Canadian Institutes of Health Research (Grant No. 317877).

## Declarations of interest

None.

## Author contributions

Authors S.S., R.H., S.W., S.V.P., T.J., and S.E.C. contributed to the conception and design of the study. Author S.L. performed the analyses of the data. All authors contributed equally to the interpretation of the data and writing of this manuscript.

Clinicaltrials.gov ID: NCT02920112

## Conflict of interest

The authors have no conflicts of interest to declare.

## Ethical statement

Ethics approval for this study was obtained from the University Health Network Research Ethics Board.

## Acknowledgements

The authors would like to thank the patients who participated in the study as well as the Toronto Western Hospital Bariatric Surgery Program team members for their support.

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