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ORIGINAL CONTRIBUTIONS

Employment Outcomes 2 Years After Bariatric Surgery: Relationship to Quality of Life and Psychosocial Predictors

Karin Kantarovich [1,2] · Susan Wnuk [1,2,3] · Stephanie Cassin [2,3,4] · Raed Hawa [1,2,3] · Sanjeev Sockalingam [1,2,3,5]

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Abstract

Objectives Bariatric surgery is the most effective long-term treatment for severe obesity. In addition to sustained weight loss, bariatric surgery can result in improvements in mental and physical health-related quality of life (HRQOL) and, consequently, work capacity. The purpose of our study was to evaluate changes to employment impairment (EI) and related HRQOL in patients 2 years post-bariatric surgery.

Methods Prospective data was collected on a cohort of 211 patients who underwent bariatric surgery. The Lam Employment Absence and Productivity Scale (LEAPS) and the 36-Item Short Form Survey (SF-36) were used to assess pre- and post-operative EI and physical and mental HRQOL, respectively. Predictors of work impairment changes were analyzed via multiple regression analysis and included demographic variables, history of psychiatric illness, and depression and anxiety self-report measures.

Results Significant improvements in employment outcomes 2 years following surgery were noted with 68% of participants reporting an overall decrease in EI (total LEAPS score change = − 2.43 ± 5.76, $p < 0.001$), and 44% participants reporting an increase in work productivity (LEAPS productivity score change = − 0.67 ± 2.38, $p < 0.001$). Bariatric surgery was also associated with significant improvements in physical (change = 17.41 ± 10.72, $p < 0.001$) and mental (change = 2.67 ± 12.89, $p = 0.001$). Improvements in HRQOL predicted improvements in work-related impairment and productivity, while history of psychiatric illness predicted was associated with reduced improvement in work productivity.

Conclusions Our results provide further evidence of improvement in work productivity and reduction in EI post-bariatric surgery. This study also provides insights into potential predictors of work-related impairment and productivity.

Keywords Bariatric surgery · Employment · Quality of life · Mental health

Introduction

In the last 42 years, global rates of obesity have nearly tripled [1]. Annual global costs attributed to the obesity pandemic amount to ~ $2 trillion [2]. Although individuals with a body mass index (BMI) > 35 kg/m^2 (class II–III obesity) represent 37% of the obese population, as much as 61% of excess costs are attributable to this group [3].

Obesity results in direct and indirect increased costs to employers and places a large burden on national health and insurance pension systems [4, 5]. Specifically, obesity is associated with reduced productivity while at work, increased sick

✉ Sanjeev Sockalingam
sanjeev.sockalingam@camh.ca

Karin Kantarovich
karkan@yorku.ca

Susan Wnuk
susan.wnuk@uhn.ca

Stephanie Cassin
stephanie.cassin@psych.ryerson.ca

Raed Hawa
raed.hawa@uhn.ca

1 Bariatric Surgery Program, Toronto Western Hospital, Toronto, Canada

2 Centre for Mental Health, University Health Network, Toronto, Canada

3 Department of Psychiatry, University of Toronto, Toronto, Canada

4 Department of Psychology, Ryerson University, Toronto, Canada

5 Centre for Addiction and Mental Health, 33 Russell Street, Suite 2065, Toronto, ON M5S 2S1, Canada

leave, and increased disability claims [6, 7]. Employees with obesity have an estimated 17–20% decrease in productivity when compared with workers without obesity resulting from a greater number of missed days that is attributable to obesity-related health problems [3, 8, 9]. In a non-surgical study sample, female employees with class III obesity (BMI ≥ 40 kg/m^2) missed almost a week more of work (8.2 versus 3.4 sick days), and male employees with class III obesity missed almost twice as much work (5 versus 3 sick days) each year compared with "normal" weight workers (BMI = 18.5–24.9 kg/m^2) [10]. Another study reported that bariatric surgery candidates miss an average of 33 work days due to illness or injury in the year prior to surgery, compared with only 3 days lost by an average US worker for the same reason [8]. In a study of 72,778 employees, those with BMI ≥ 30 kg/m^2 had the highest short-term disability costs ($6313 per annum), greatest number of absences, and lowest productivity ($p < 0.001$) [11]. Overall, these indirect non-medical costs account for 54–59% of the financial expenses associated with obesity [12].

Bariatric surgery is an effective treatment resulting in durable weight loss for patients with class II–III obesity [13]. In a recent meta-analysis on bariatric surgery weight loss outcomes, the percent excess weight loss was 62.58% at ≥ 5 years for laparoscopic Roux-en-Y gastric bypass (LRYGB) and 53.25% at ≥ 5 years after laparoscopic sleeve gastrectomy (LSG) [14]. In addition to weight loss and resolution of obesity-related comorbidities, bariatric surgery alleviates costs associated with disability benefits and absenteeism [15]. Studies on post-surgical outcomes have noted a decrease in absenteeism [7, 16, 17], a 5.7 h increase in the number of hours worked per week [15], and a 22–25% increase in the number of patients in full- or part-time employment [18]. More recent studies on employment status after bariatric surgery note significant decreases in sick leave [19] and a 17% improvement in number of patients employed both 1 and 2 years following surgery [20, 21].

Despite these overall benefits of bariatric surgery on work-related outcomes, it is unclear how psychiatric disorders, which are common in severe obesity, impact changes in employment outcomes after surgery. Studies have shown that approximately 70% of bariatric surgery candidates have a history of psychiatric illness [22], with mood disorders, binge eating disorder, and anxiety disorders being the most prevalent psychiatric disorders pre-surgery [23]. Estimates that annual costs of mental illness and substance abuse cost employers approximate $80 to $100 billion in indirect expenses alone, suggesting that comorbid psychiatric illness may further compound obesity-related work impairment [24].

Study data suggests that the prevalence of psychiatric disorders and severity of psychiatric symptoms, such as depression, are significantly lower after bariatric surgery compared with pre-surgery [25]. In a meta-analysis, post-operative bariatric surgery outcomes consistently demonstrate a decrease in the prevalence of depression (7 studies; 8–74% decrease) and the severity of depressive symptomology (6 studies; 40–70% decrease) [23]. Data from the Longitudinal Assessment of Bariatric Surgery (LABS) consortium demonstrated that patients who experienced improvements in physical functioning and depressive symptoms were less likely to exhibit impaired work due to poor health [26]. Despite these studies, the literature has generally been limited by retrospective study designs, use of employment measures with unknown psychometric properties, and unclear data on the association of psychiatric symptoms (beyond depression) on work functioning and productivity.

A previous study examining employment impairment (EI) and work productivity at 1 year post-surgery showed significant improvements in both work-related outcomes [27]. Moreover, this study identified health-related quality of life (HRQOL), depressive symptoms, and anxiety symptoms as significant predictors of change in EI. Given that patients experience the greatest improvement in HRQOL and depressive and anxiety symptoms at 1 year post-surgery, additional data is needed to establish EI trends after bariatric surgery beyond this initial year post-surgery [28].

The primary objective of the present study was to evaluate changes to EI in patients 2 years following bariatric surgery in relation to changes in HRQOL. We hypothesized that employment capacity and mental and physical quality of life would all improve 2 years following bariatric surgery. As a secondary objective, we also aimed to identify potential psychosocial predictors of employment outcomes following bariatric surgery. We hypothesized that a history of psychiatric illness would be associated with a lower magnitude of improvement in post-operative employment impairment and productivity.

Methods

Participants

The study sample consisted of consecutive patients recruited on a voluntary basis from the Toronto Bariatric Surgery Centre of Excellence (TBSCE) who received bariatric surgery between February 2010 and November 2016. Informed consent was obtained by a clinician not involved in the study. Participants were 18 years or older and employed. They received RYGBS, unless a SG was recommended based on surgeon assessment. A total of 343 patients who underwent surgery were recruited to participate and completed baseline measures, with 211 patients completing measures 2 years post-surgery. The study was approved by the University Health Network Research Ethics Board in accordance with the ethical guidelines of the 1975 Declaration of Helsinki.

Measures

Demographic information was collected during the first pre-surgery assessment appointment by nurse practitioners and social workers (Table 1). All measures were collected pre-surgery and 2 years post-surgery (+ 3 months to account for delayed post-surgical appointments). Height and weight measurements were taken during the pre-surgical assessment process and at 2 years post-surgery by bariatric clinicians. Percent total weight loss (%TWL) was calculated at 2 years post-surgery [%TWL = (pre-surgery weight − 2 years post-surgery weight) / pre-surgery weight].

Employment, depression, anxiety, and HRQOL data were collected after participants successfully completed the pre-surgical assessment process and at 2 years post-surgery. All participants also underwent a psychiatric assessment for the diagnosis of any psychiatric comorbidities by a psychiatrist or psychologist prior to surgery. All assessments and measures were administered as part of the program's pre-bariatric surgery process, which have been previously described in the literature [29, 30].

The Lam Employment Absence and Productivity Scale (LEAPS) is a validated self-report questionnaire that measures work impairment and work productivity in individuals who are presently employed [31]. The LEAPS consists of seven items that are rated on a 5-point Likert scale and yield a LEAPS total score to assess work impairment (range 0–28), as well as a work productivity sub-scale score (range 0–12) based on three of the items. Our data analysis included raw scores and their differences (difference scores = LEAPS score 2 years post-surgery − LEAPS score pre-surgery). Higher LEAPS scores indicate higher impaired work functioning and decreased work productivity. The LEAPS has been shown to have high internal consistency (Cronbach's alpha = 0.89) and high correlation with other validated measures of work functioning and productivity [31]. Given that the LEAPS was originally implemented in depressed patient populations, it has been considered an appropriate measure for bariatric surgery candidates who have high rates of depression [27] and has been implemented as a measure of EI in the bariatric surgery population previously in the literature [32].

Table 1 Participant characteristics

Characteristics	
Gender (female), *n* (%)	145 (81.9%)
Age (years)	44.86 ± 9.5
Race, *n*	
Black (African American)	4 (2.3%)
White (Caucasian)	121 (68.4%)
Other	52 (29.4%)
Pre-surgery type of employment, *n* (%)	
Sales and service	43 (24.3%)
Business, finance, and administration	38 (21.5%)
Technical Occupation	9 (5.1%)
Trades, transport, equipment operator	6 (3.4%)
Processing, manufacturing, utilities	2 (1.1%)
Professional	27 (15.3%)
Management	11 (6.2%)
Other	41 (23.2%)
Pre-surgery BMI (kg/m^2)	48.85 (8.2)
%TWL at 2 years post-surgery	32.51 ± 12.76

Continuous variables reported as means ± standard deviation

The Medical Outcomes Study Short Form 36 Health Status Survey (SF-36) was used to assess participants' mental and physical HRQOL [33]. The SF-36 evaluates eight domains of functioning, producing a physical component score (SF36-PCS) and mental component score (SF36-MCS). The score range is from 0 to 100, representing the lowest or worst level of functioning to the highest or best possible level of functioning, respectively. It has been used in previous research in bariatric surgery populations [27, 34] and has demonstrated good construct validity, high internal consistency, and high test-retest reliability [35].

The Patient Health Questionnaire-9 (PHQ9) was used to evaluate depressive symptoms. The PHQ9 is a 9-item self-report questionnaire. Items are scored from 0 to 3 and summed to produce a total score (range 0–27) [36]. Severity cutoff points are 5 for mild, 10 for moderate, 15 for moderately severe, and 20 for severe depressive symptoms. The PHQ9 has good sensitivity and specificity when compared with structured clinical interviews [37]. It has also been used in previous longitudinal studies involving bariatric surgery patient populations [28, 38].

The Generalized Anxiety Disorder-7 (GAD7) was used to evaluate anxiety symptoms. The GAD7 has 7 items, each of which is scored between 0 and 3 and summed to yield a total score (range 0–21) [39]. Severity cutoff points are 5 for mild, 10 for moderate, and 15 for severe anxiety. It was validated in 2740 primary care patients [39] and has been previously used in bariatric surgery populations [28, 40].

The Mini International Neuropsychiatric Interview (MINI) version 6.0 with supplemented modules for binge eating disorder and generalized anxiety disorder (based on Diagnostic and Statistical Manual of Mental Disorders IV criteria) was used to diagnose lifetime history (past or current) of psychiatric disorders [41]. These included mood, anxiety, psychotic, attention deficit, eating, and substance use disorders. The MINI has good reliability and validity, as well as strong concordance with the Structured Clinical Interview for DSM Axis I Disorders (SCID; kappa = 0.84) in primary care settings [41].

Statistical Analyses

All statistical analyses were conducted using the Statistical Package for Social Science (SPSS). Descriptive statistics were computed to characterize the study population.

The primary outcomes in the study were changes in LEAPS total scores ($\Delta LEAPS_{TOTAL)}$ and changes in SF-36 physical (ΔSF36-PCS) and mental (ΔSF36-MCS) component scores. $\Delta LEAPS_{TOTAL}$ over the 2-year interval was derived by calculating the difference scores on the LEAPS (2 years post-surgery – pre-surgery baseline) and a similar calculation was used to derive a change in LEAPS work productivity ($\Delta LEAPS_{WP}$). To examine the trajectory of employment impairment post-surgery, a non-parametric Wilcoxon signed rank test was used to assess differences in pre-surgical and 2-year post-surgical LEAPS scores, as well as 1-year and 2-year post-surgical LEAPS work productivity scores based on data distribution. A paired *t* test was used to assess differences from baseline and 2-year post-surgical SF36-PCS scores. A non-parametric Wilcoxon signed rank test was used to assess differences in pre-surgical and 2-year post-surgical SF36-MCS scores.

We used a multiple linear regression to assess whether baseline demographic characteristics or clinical factors were associated with changes in LEAPS total scores or LEAPS productivity scores. Bivariate associations were assessed between LEAPS outcomes and age, gender, %TWL, pre-surgery BMI, history of any Axis I psychiatric disorder, history of a mood disorder, history of an anxiety disorder, history of an eating disorder, change in PHQ9, change in GAD7, change in SF36-PCS, and change in SF36-MCS. Change in PHQ9, GAD7, and SF36 scores was calculated as the difference between 2-year post-surgery scores and pre-surgery scores.

Results

Participant Characteristics

Table 1 summarizes the study sample characteristics. Of the participants who attended their 2-year post-surgery appointment, 211 had pre-surgical and 2-year post-surgical LEAPS scores, 177 of whom also had complete data for SF36-PCS and SF36-MCS at both time points. The majority of the participants were female (81.9%), Caucasian (68.4%), full-time workers prior to surgery, and employed in sales or service industries (24.3%) and had a mean pre-surgery BMI of 48.9 kg/m^2 and mean age pre-surgery of 44.86 years.

Employment and Quality of Life Outcomes Post-bariatric Surgery

LEAPS scores significantly decreased following bariatric surgery, indicating reduced work impairment ($\Delta LEAPS_{TOTAL}$ = -2.43 ± 5.76, $p < 0.001$) and an improvement in work productivity ($\Delta LEAPS_{WP}$ = − 0.67 ± 2.38, $p < 0.001$) (see Table 2), such that 68% (143 out of 211) of the patients reported decreased work-related impairments and 44% (92 out of 211) reported increased productivity.

While work impairment significantly improved from pre-surgery to 2 years post-surgery, there was no significant difference in work impairment from year 1 to year 2 post-surgery ($p = 0.333$).

Both SF36-PCS (ΔSF36-PCS = 17.41 ± 10.72, $p < 0.001$) and SF36-MCS (ΔSF36-MCS = 2.67 ± 12.89, $p = 0.001$) improved at 2 years post- surgery (see Table 2), with 96% (170/177) of patients reporting improvements in SF36-PCS and 60% (106/177) reporting improvements in SF36-MCS.

Predictors of Employment Outcomes 2 Years After Bariatric Surgery

Table 3 summarizes bivariate associations between predictors and outcomes. Multiple linear regression analysis for $\Delta LEAPS_{TOTAL}$ scores at 2 years following bariatric surgery identified change in ΔSF36-MCS ($\beta = -0.16$; confidence interval (CI) – 0.25, − 0.07; $p = 0.001$) and ΔSF36-PCS ($\beta = -0.16$; CI – 0.24; − 0.07, $p = 0.001$) scores as significant predictors after holding all other predictors constant (see Table 3).

Multiple linear regression analysis for $\Delta LEAPS_{WP}$ at 2 years post-surgery identified ΔSF36-MCS ($\beta = -0.06$; CI – 0.10, − .01; $p = 0.13$) and ΔSF36-PCS ($\beta = -0.05$; CI – 0.09, − 0.003; $p = 0.036$) as significant predictors after holding all other predictors constant. In addition, a history of an Axis I disorder ($\beta = -1.61$; CI – 2.95, − 0.27; $p = 0.02$) was associated with a reduced $\Delta LEAPS_{WP}$ scores after holding all other predictors constant. However, a history of mood disorders predicted an increased $\Delta LEAPS_{WP}$ scores ($\beta = 1.32$; CI 0.81, 2.57; $p = 0.037$) (see Table 4).

Discussion

The primary objective of this study was to evaluate changes in work-related impairment and productivity as well as mental and physical HRQOL 2 years following bariatric surgery using a standardized measure of work-related functioning. As predicted, improvements in employment-related functioning and HRQOL were maintained 2 years following bariatric surgery. Specifically, patients reported significant improvements in mental and physical functioning, total EI (negative $\Delta LEAPS_{TOTAL}$), and work productivity (positive $\Delta LEAPS_{WP}$). The magnitude of change in EI following bariatric surgery (mean = − 2.43) approached a clinically meaningful improvement, previously defined as difference in LEAPS scores of 2.5 or more [42]. Furthermore, changes in EI scores between years 1 and 2 post-surgery did not significantly differ, suggesting that improvements in work functioning continue to be maintained 2 years after bariatric surgery. This contrasts trends for mental HRQOL observed in a

Table 2 Changes in LEAPS and quality of life outcomes 2 years post-bariatric surgery

Employment and QOL outcome	Pre-surgery	2 years post-surgery	Mean difference ± SD	*p* value
LEAPS total score	60.00 ± 50.04	3.57 ± 4.91	2.43 ± 5.76	< 0.001
LEAPS productivity	1.76 ± 2.13	10.09 ± 20.08	0.67 ± 2.38	< 0.001
SF36-PCS	34.24 ± 10.27	51.65 ± 7.87	− 17.41 ± 10.72	< 0.001
SF36-MCS	48.57 ± 10.42	51.24 ± 11.50	− 2.67 ± 12.89	0.001

Scores were reported as means ± standard deviation. Higher LEAPS scores indicate greater impairment; negative difference scores indicate improved employment, depression, and anxiety outcomes 2 years post-surgery

comparable bariatric population, which showed a deterioration in mental HRQOL between years 1 and 2 post-surgery [28].

In addition, this study explored potential predictors of improvement in work functioning. Results from our previous study of 1-year post-surgical outcomes identified improvements in depression, anxiety, and mental quality of life as predictors of improvements in both total EI and productivity [27]. The findings of this study suggest that improvements in mental quality of life continue to predict improved work-related functioning at 2 years post-surgery. A novel finding was that improvements in physical quality of life predicted 2-year outcomes both in EI and productivity, while alleviation of anxiety and depression symptoms was unrelated to either outcome of work functioning. Our results suggest that improvements in both mental and physical quality of life are predictive of more long-term employment outcomes, in contrast to improvements in current psychiatric symptomology.

Consistent with our a priori hypothesis, a past history of Axis I disorders was associated with a smaller improvement in work productivity after surgery. However, patients with a history of mood disorders specifically reported greater improvements in productivity 2 years after bariatric surgery. It is possible that this is an incidental finding due to the small sample size of the study and thus warrants replication in a larger patient sample. In addition, the bariatric surgery program in this study uses a rigorous assessment process and patients who present to the clinic with poorly controlled or severe psychiatric symptoms (e.g., psychiatric hospitalizations or suicidal ideation in the past year) are not deemed ready for bariatric surgery [43]. Participants in the current study were also approved for bariatric surgery and had a relatively low symptom severity according to PHQ9 scores and, as a result, may not be a representative sample of all individuals with a lifetime history of depression. This might also explain why current depressive symptomology (PHQ9 difference scores) was not identified as a significant predictor of changes in work capacity. Lastly, a past study showed an association between a history of a mood disorder and better physical and mental HRQOL at 2 years post-surgery, which could explain our current finding [28].

The results of this study suggest that bariatric surgery has a positive impact on HRQOL and, consequently, work capacity. Future work could use mediation analyses to explore psychiatric illness as a moderator of the relationship between HRQOL and employment outcomes in bariatric surgery

Table 3 Bivariate and multiple linear regression analyses of change in LEAP total score

Variable	Bivariate		Multiple linear regression			
	Coefficient	*p* value	Coefficient	LL 95% CI	UP 95% CI	*p* value
Pre-surgery age	− 0.06	0.19	− 0.03	− 0.11	0.06	0.54
Gender (female)	0.08	0.13	− 0.03	− 2.27	2.22	0.98
%TWL	0.08	0.36	0.04	− 0.03	0.19	0.25
Pre-surgery BMI	0.01	0.50	− 0.02	− 0.12	0.09	0.72
History of Axis I disorder	− 0.03	0.37	− 2.53	− 5.21	0.16	0.07
History of a mood disorder	0.03	0.33	1.98	− 0.52	4.47	0.12
History of an anxiety disorder	− 0.02	0.38	0.60	− 1.88	30.07	0.63
History of an eating disorder	− 0.04	0.28	1.87	− 0.83	4.58	0.17
Difference in GAD-7[a]	0.50	< 0.001	0.15	− 0.10	0.39	0.24
Difference in PHQ-9[a]	0.54	< 0.001	0.15	− 0.08	0.37	0.19
Difference in SF36-MCS[a]	− 0.51	< 0.001	− 0.16	− 0.25	− 0.07	0.001
Difference in SF36-PCS[a]	− 0.168	0.04	− 0.16	− 0.24	− 0.07	0.001

[a] Difference = post-surgery score − pre-surgery score

Adjusted R^2 = 0.37, $F(12, 100) = 6.26$, $p < 0.001$

Table 4 Bivariate and multiple linear regression analyses of change in LEAP productivity sub-scale

Variable	Bivariate		Multiple linear regression			
	Coefficient	*p* value	Coefficient	LL 95% CI	UP 95% CI	*p* value
Pre-surgery age	− 0.07	0.17	− 0.01	− 0.06	0.03	0.54
Gender (female)	0.09	0.11	0.01	− 1.11	1.13	0.98
%TWL	0.05	0.28	0.02	− 0.02	0.06	0.33
Pre-surgery BMI	− 0.02	0.39	− 0.01	− 0.07	0.04	0.62
History of Axis I disorder	− 0.05	0.23	− 1.61	− 2.95	− 0.27	0.02
History of a mood disorder	0.07	0.16	1.32	0.08	2.57	0.04
History of an anxiety disorder	− 0.02	0.41	0.34	− 0.90	1.57	0.59
History of an eating disorder	− 0.01	0.46	0.98	− 0.37	2.33	0.15
Difference in GAD-7[a]	0.36	< 0.001	0.04	− 0.09	0.16	0.57
Difference in PHQ-9[a]	0.40	< 0.001	0.05	− 0.06	0.17	0.34
Difference in SF36-MCS[a]	− 0.40	< 0.001	− 0.06	− 0.10	− 0.01	0.01
Difference in SF36-PCS[a]	− 0.09	0.17	− 0.05	− 0.09	− 0.01	0.04

[a] Difference = post-surgery score − pre-surgery score

Adjusted $R^2 = 0.18$, $F(12, 100) = 30.08$, $p < 0.001$

populations. Cost-effectiveness analyses have generally attributed the economic benefits of bariatric surgery to post-operative improvement in comorbidities and reductions in medical spending [44]; however, improvements observed in this and other studies on employment impairment and productivity suggest that surgery may also have additional economic benefits related to employment.

The strengths of the current study include the prospective study design that assessed changes in work-related functioning at three time points from pre-surgery to 2 years post-surgery. The study also recruited a sample of consecutive referrals to minimize selection bias and utilized a standardized employment measure and multiple measures of psychopathology with strong psychometric properties that have frequently been used in bariatric surgery samples.

There are several limitations of this study to consider when interpreting the results. First, the study was conducted in a setting where surgery was offered as part of universal healthcare coverage, which could limit study result generalizability. Furthermore, we only examined employment outcomes in patients who were employed from pre-surgery to 2 years post-surgery given the focus of the LEAPS, and thus, the study does not capture patients who were unemployed pre-surgery or became unemployed post-surgery. Given this, using the LEAPS as the sole measure of work impairment and productivity limited the scope of our study. We recognize that employment impairment is very complex; as it is difficult to capture, there may be varying definitions. In the literature, it is has been referred to as work impairment, occupational impairment, or activity impairment as well. Throughout the literature, it is often defined by the employment measure being used, and in this case, the LEAPS, which was originally validated through a series of scale validation procedures, provides some validity evidence for its use as a patient-reported measure of employment impairment [31]. As defined by the LEAPS, employment impairment is defined by patients as their self-reported inability to function at work. In addition, decreased adherence and attendance to post-surgical appointments limited our sample size and ability to obtain long-term data on all patients.

Given that participant recruitment is voluntary and patients who are interested in being involved in the study approach the clinician in charge of recruitment themselves, attrition did limit the final results. While a total of 343 patients underwent a full baseline assessment for this study, there were a total of 211 patients who had pre-surgical and 2-year post-surgical LEAPS scores, 177 of whom also had complete data for SF36-PCS and SF36-MCS at both time points. While there were no significant differences at baseline on the SF-MCS scores between participants who did and did not have 2-year data, these two groups differed significantly on LEAPS total scores (SD = 6.26, $p < 0.001$), LEAPS productivity scores (SD = 2.83, $p < 0.001$), and SF-PCS scores (SD = 10.31, $p = 0.002$). The magnitude of attrition in our study (38% attrition at 2 years) is comparable with those in other reputable studies in the literature which have shown a 2-year attrition rate at 31% [45]. Finally, the impact of weight-based discrimination on employment outcomes was not evaluated in the current study. It has been shown that weight-based discrimination is related to psychological illness and employment outcomes [46]; weight loss experienced after bariatric surgery could have therefore influenced the impact of weight-based discrimination on psychosocial and work-related functioning in our study. Future research should examine the association between weight-based discrimination in employment settings, psychosocial factors, and outcomes following bariatric

surgery. Future studies should also consider evaluating changes in other obesity-related conditions, such as sleep disorders and diabetes, in relation to employment functioning after surgery.

In summary, the results of the current study further support the significant improvements in work capacity and mental and physical wellbeing experienced by patients after undergoing bariatric surgery, as well as the maintenance of these improvements 2 years post-surgery. Improvements in HRQOL appear to predict improvements in work-related impairment and productivity, while having a past history of any psychiatric illness significantly predicted reduced improvements in work productivity after bariatric surgery. Only a history of a mood disorder had a greater magnitude of improvement in work productivity.

Interventions aimed at supporting and maintaining postoperative mental health outcomes after bariatric surgery may further enhance employment-related functioning and warrant further study. Future research should examine more specific employment outcomes and include longitudinal follow-up data beyond 2 years post-surgery.

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Special Characters and Statistical Abbreviations SDstandard deviation
CIconfidence interval
βstandardized beta (coefficient beta standardized to unit of standard deviation)

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Statement All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent Statement Informed consent was obtained from all individual participants included in the study.

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