Becoming Physically Active After Bariatric Surgery is Associated With Improved Weight Loss and Health-related Quality of Life

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The purpose of this study was to determine whether pre- to postoperative increases in physical activity (PA) are associated with weight loss and health-related quality of life (HRQoL) following bariatric surgery. Participants were 199 Roux-en-Y gastric bypass (RYGB) surgery patients. The International Physical Activity Questionnaire (IPAQ) was used to categorize participants into three groups according to their preoperative and /1-year postoperative PA level: (i) *Inactive/Active* (<200-min/week/≥200-min/week), (ii) *Active/Active* (≥200-min/week/≥200-min/week) and (iii) *Inactive/Inactive* (<200-min/week/<200-min/week). The Medical Outcomes Study Short Form-36 (SF-36) was used to assess HRQoL. Analyses of covariance were conducted to examine the effects of PA group on weight and HRQoL changes. *Inactive/Active* participants, compared with *Inactive/Inactive* individuals, had greater reductions in weight (52.5 ± 15.4 vs. 46.4 ± 12.8 kg) and BMI (18.9 ± 4.6 vs. 16.9 ± 4.2 kg/m²). Weight loss outcomes in the *Inactive/Active* and *Active/Active* groups were similar to each other. *Inactive/Active* and *Active/Active* participants reported greater improvements than *Inactive/Inactive* participants on the mental component summary (MCS) score and the general health, vitality and mental health domains ($P < 0.01$). Although the direction of causation is not clear, these findings suggest that RYGB patients who become active postoperatively achieve weight losses and HRQoL improvements that are greater than those experienced by patients who remain inactive and comparable to those attained by patients who stay active. Future randomized controlled trials should examine whether assisting patients who are inactive preoperatively to increase their PA postoperatively contributes to optimization of weight loss and HRQoL outcomes.

INTRODUCTION

Bariatric surgery is quickly emerging as a standard treatment for severely obese (BMI ≥40 kg/m²) individuals, because of its significant long-term effects on body weight, obesity-related comorbidities and health-related quality of life (HRQoL) (1–3). Surgical success, however, is dependent on more than the procedure that is employed and the proficiency with which a particular technique is performed. Several nonsurgical factors including demographic and weight-related characteristics, eating patterns, and psychosocial factors may contribute to variability in postoperative weight loss and HRQoL improvement (4–6). Yet, little is known about whether changes in behaviors, particularly physical activity (PA), following bariatric surgery promote enhanced weight loss and HRQoL improvements in this population.

Cross-sectional studies suggest that postoperative PA is associated with enhanced weight loss and maintenance following bariatric surgery (7–11). Two studies comprising samples of >1,000 patients—one conducted in the United States following Roux-en-Y gastric bypass (RYGB) and the other in France following laparoscopic adjustable gastric banding (LAGB)—found that categorical endorsement of participation in regular PA postoperatively was related to better weight loss maintenance at 2 years postoperatively (8,11). More recently, postoperative participation in ≥150 min of moderate–vigorous intensity activity, as assessed by the International Physical Activity Questionnaire (IPAQ), was shown to be associated with greater weight loss and BMI change at both 6 months and 1 year following RYGB (10). This study, however, did not include walking in the assessment of PA. In addition, this study was cross-sectional and consequently does not provide any information about pre to postoperative changes in PA.

Few prospective studies have assessed pre- to postoperative changes in PA among bariatric surgery patients. In these studies (9,12,13), the proportion of patients reporting participation

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in PA and the amount of PA-related caloric expenditure were shown to increase significantly across pre and postoperative assessments, but the associations between PA and weight loss were not examined.

Similarly, only a small number of studies have prospectively assessed both PA and HRQoL in bariatric surgery populations. These studies suggest that both PA and HRQoL levels increase after surgery (12,13), although associations between PA and HRQoL were not examined. Only one study, to our knowledge, has assessed the relationship between PA and HRQoL in a bariatric surgery population and associations were demonstrated preoperatively (14).

The present study builds on prior research by prospectively evaluating the importance of preoperative to postoperative changes in PA, including walking and activities of a moderate and vigorous intensity, in relation to both weight loss and HRQoL improvements. We hypothesized that participants who either went from being inactive preoperatively to being active at 1 year postoperatively or were active at both time points would experience greater weight change and improvements in HRQoL than patients who remained inactive at both time points.

METHODS AND PROCEDURES

Participants

Participants were patients aged 18–65 years who underwent Roux-en-Y gastric bypass surgery at Virginia Commonwealth University's Surgical Weight Loss Center between January 2004 and March 2007. Many of these participants were drawn from a patient cohort in a previous cross-sectional study that examined the relationship between PA level and weight loss outcomes (10). The current study sample consisted of those patients who had sufficient time to reach 1-year follow-up and had preoperative and postoperative PA assessments. Completers (n = 199/68%) did not significantly differ from noncompleters (n = 94/32%) on preoperative demographic and weight variables. Participants were predominantly women (n = 165/83%), white (n = 154/77%), middle-aged (43.8 ± 11.0 years) and severely obese prior to surgery (BMI = 49.8 ± 7.8 kg/m^2). The study was approved by the Virginia Commonwealth University Institutional Review Board for the Protection of Human Subjects in Research.

Measures

PA and HRQoL measures were administered prior to surgery and at ~1 year after surgery. Completion of questionnaires for the preoperative and postoperative time points occurred on average 23 ± 26 days before surgery and 379 ± 46 days after surgery. Compensation for completing the questionnaires was not provided.

PA. The International Physical Activity Questionnaire short form (IPAQ-short), a self-administered 7-day recall measure, was used to assess PA at the preoperative and postoperative time points (15). The IPAQ-short demonstrates acceptable levels of test-retest reliability in comparison with other established self-report PA measures and fair to moderate associations with accelerometer measures (15,16). The IPAQ-short assesses walking and activities of a moderate and vigorous intensity that are performed continuously for at least 10 min in all domains of everyday life (i.e., leisure, occupational, household and transport). Given evidence from randomized controlled trials suggesting that amount of PA is more important than intensity in promoting long term weight loss in overweight and obese individuals (17,18), we computed total duration of PA by summing reported minutes spent walking and participating in activities of a moderate and vigorous intensity. Further, since a previous study (10) used 150 min of PA per week as a cutoff criterion for categorization of active and inactive RYGB participants, but walking was not included, we used a higher PA threshold of 200 min per week in the current study. This level of activity is also consistent with evidence and guidelines indicating that levels of PA higher than those recommended for health benefits may be necessary to improve weight loss and minimize weight regain in previously overweight and obese individuals (19–21). Accordingly, participants were categorized into the following groups: (i) *Inactive/Active* (<200 min per week preoperatively/≥200 min per week postoperatively; n = 68), (ii) *Active/Active* (≥200 min per week preoperatively/ ≥200 min per week postoperatively; n = 83) and (iii) *Inactive/Inactive* (<200 min per week preoperatively/<200 min per week postoperatively; n = 39). Only 9 went from being active preoperatively to being inactive postoperatively; these individuals were excluded from analysis, resulting in a total of 190 participants.

HRQoL. Version 2.0 of the Medical Outcomes Study Short Form-36 (SF-36) was used to assess HRQoL (22). The SF-36 is the most widely used measure of subjective health status, consisting of 36 questions that assess 8 domains of functioning: Physical functioning, role-limitations because of physical problems, bodily pain, general health, vitality, social functioning, role-limitations because of emotional problems, and mental health. The eight dimensions can also be combined to produce a Physical Component Summary (PCS) and a Mental Component Summary (MCS). Scores range from 0 to 100, with higher scores indicating better HRQoL, and are standardized to a population normal distribution with a mean of 50 and a standard deviation of 10. The SF-36 has been shown to have high internal consistency, reliability and validity across both general populations and specific patient groups (23). Moreover, the SF-36 has specifically been used in obese and bariatric surgery populations to demonstrate both the burdens of obesity and improvements in HRQoL following weight loss (24,25).

Height, weight and weight change calculations. Height and weight were objectively measured preoperatively and postoperatively using a stadiometer and standard physician's scale. Height was measured to the nearest 0.5 cm and weight to the nearest 0.1 kg. BMI was calculated as (weight in kilograms)/(height in meters)^2. Weight loss was calculated as operative weight − 1-year follow-up weight. Percent weight loss was calculated as (operative weight − 1-year follow-up weight)/(operative weight) × 100. Percent excess weight loss was calculated as (weight loss)/(excess weight) × 100 with excess weight defined as weight above ideal body weight based on 1983 Metropolitan Height and Weight Tables for a person of medium frame (26).

Statistics

Analyses were performed using the Statistical Package for the Social Sciences (SPSS) for Windows, version 14.0. Descriptive statistics are presented as mean ± s.d. and percentages for continuous and categorical variables, respectively. χ^2-analyses were used to compare differences in categorical demographic variables between the *Inactive/Active*, *Active/Active* and *Inactive/Inactive* groups. ANOVAs with Bonferroni-adjusted *post hoc* contrasts were conducted to examine group differences in weight, BMI and HRQoL at preoperative and 1-year postoperative time points. Due to heterogeneity of variance in PA data, Welch's test of equality of means with Games–Howell adjusted contrasts was used to examine group differences in PA. Analysis of covariance was used to examine differences among groups in changes in weight and HRQoL variables across preoperative and 1-year postoperative time points, adjusting for differences in corresponding baseline values and demographics (i.e., age, sex, and ethnicity). Follow-up pair wise comparisons, using the Holm's sequential Bonferroni procedure to adjust for multiple comparisons, were conducted to evaluate between-group differences in weight and HRQoL changes. Spearman rank order correlation coefficients were computed to determine the relationship between changes in PA and both weight loss and improvements on the SF-36 physical and MCS scores for the entire sample (n = 190).

RESULTS

Participant characteristics by PA group

Characteristics of participants by PA group at the preoperative and postoperative time points are presented in **Table 1**. As shown, 68 participants (36% of the sample) reported at least 200 min of activity at baseline and remained active postoperatively. Of the 122 participants who were inactive preoperatively, more than two thirds (68%; $n = 83$) became active postoperatively (*Inactive*/*Active*), whereas 39 (20%) participants reported continuing to be inactive (*Inactive*/*Inactive*). These three groups, however, could not be distinguished preoperatively with respect to demographics, weight characteristics or PA patterns, with the exception of the *Active*/*Active* group being more active than either of the other groups, by definition. Postoperatively, *Active*/*Active* participants reported more total PA minutes than either the *Inactive*/*Active* or *Inactive*/*Inactive* participants.

Weight changes by PA group

Differences in weight loss (kg), BMI reduction, percent weight loss and percentage of excess weight loss as a function of PA group are presented in **Table 2**. Weight loss, BMI reduction, percent weight loss and percent excess weight loss were greater in the *Inactive*/*Active* group as compared to the *Inactive*/*Inactive* group, adjusting for differences in age, sex, ethnicity and preoperative weight or BMI. The *Active*/*Active* group did not differ from either of the other two groups.

HRQoL changes by PA group

Differences in preoperative HRQoL and preoperative to postoperative HRQoL change as a function of PA group are presented in **Table 3**. The *Active*/*Active* group had higher scores before surgery than the *Inactive*/*Active* or *Inactive*/*Inactive* groups on the SF-36 physical component summary measure

Table 1 Demographic, weight and physical activity characteristics by preoperative/postoperative physical activity group

	Inactive/Active ($n = 83$)	Active/Active ($n = 68$)	Inactive/Inactive ($n = 39$)	
	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	*P*
Age (years)	43.7 (11.1)[a]	41.5 (10.7)[a]	46.0 (10.0)[a]	0.103
Sex (%)				
Female	80	82	90	
Male	20	18	10	0.379
Ethnicity (%)				
White	81	81	67	
African American	19	19	33	0.166
Preoperative weight (kg)	139.9 (26.9)[a]	138.7 (29.7)[a]	138.1 (26.8)[a]	0.936
Preoperative BMI (kg/m^2)	49.8 (7.0)[a]	49.8 (8.7)[a]	50.5 (8.4)[a]	0.872
Preoperative walking (min/wk)	38.8 (52.0)[a]	407.0 (453.1)[b]	36.8 (42.2)[a]	0.001
1-year postoperative walking (min/wk)	391.3 (390.8)[a]	576.7 (544.8)[a]	41.5 (46.0)[b]	0.001
Preoperative moderate activity (min/wk)	15.3 (37.0)[a]	248.4 (306.1)[b]	6.4 (18.2)[a]	0.001
1-year postoperative moderate activity (min/wk)	274.9 (349.8)[a]	412.2 (454.7)[a]	13.4 (28.7)[b]	0.001
Preoperative vigorous activity (min/wk)	9.3 (28.9)[a]	179.7 (280.9)[b]	4.2 (15.7)[a]	0.001
1-year postoperative vigorous activity (min/wk)	179.4 (212.4)[a]	255.4 (304.0)[a]	13.2 (28.7)[b]	0.001
Preoperative total physical activity (min/wk)	63.4 (67.2)[a]	835.1 (641.4)[b]	47.4 (49.6)[a]	0.001
1-year postoperative total physical activity (min/wk)	845.7 (630.9)[a]	1244.3 (946.4)[b]	64.5 (10.3)[c]	0.001

Across rows, values with different superscript letters indicate significant ($P < 0.05$) differences between groups based on *post hoc* Bonferroni-corrected contrasts or Games-Howell contrasts for physical activity data.

Table 2 1-Year postoperative weight and BMI changes in bariatric surgery participants by preoperative/postoperative physical activity group

	Inactive/Active ($n = 83$)	Active/Active ($n = 68$)	Inactive/Inactive ($n = 39$)		
	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	*F*	*P*
Weight loss (kg)	52.5 (15.4)[a]	50.8 (13.5)[ab]	46.4 (12.8)[b]	4.1	0.018
BMI reduction (kg/m^2)	18.9 (4.6)[a]	18.3 (4.6)[ab]	16.9 (4.2)[b]	4.5	0.013
Percent weight loss (%)	38.4 (6.5)[a]	36.7 (6.1)[ab]	33.7 (7.1)[b]	5.4	0.005
Percent excess weight loss (%)	71.5 (15.5)[a]	69.8 (14.1)[ab]	63.1 (16.6)[b]	3.1	0.049

Across rows, values with different superscript letters indicate significant differences ($P < 0.05$) between groups based on *post hoc* Bonferroni-corrected contrasts. Actual means are presented. *P* values for weight loss and BMI change variables are adjusted by corresponding baseline values, age, sex, and ethnicity. *P* values for percent weight loss and percent excess weight loss are adjusted by age, sex, ethnicity, and preoperative weight.

Table 3 Health-related quality of life (HRQoL) in bariatric surgery participants by preoperative/postoperative physical activity group

	Inactive/Active	Active/Active	Inactive/Inactive	Group effect
HRQoL	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	*P*
Physical functioning				
Preoperative	33.0 (10.3)[a]	38.7 (10.4)[b]	33.8 (10.4)[ab]	0.003
Change	18.4 (9.8)[a]	15.4 (9.8)[a]	15.3 (10.5)[a]	0.276
Role-physical				
Preoperative	36.5 (11.1)[a]	42.0 (11.2)[b]	35.1 (10.1)[a]	0.002
Change	15.7 (10.6)[a]	10.9 (10.7)[a]	13.8 (10.8)[a]	0.194
Bodily pain				
Preoperative	40.2 (9.6)[a]	41.8 (8.9)[a]	41.4 (8.0)[a]	0.559
Change	13.1 (9.7)[a]	11.0 (11.2)[a]	8.9 (12.8)[a]	0.189
General health				
Preoperative	37.9 (9.7)[a]	41.3 (10.3)[a]	39.4 (9.4)[a]	0.106
Change	17.5 (9.5)[a]	15.4 (12.0)[a]	11.7 (12.2)[b]	0.009
Vitality				
Preoperative	39.9 (10.1)[a]	44.6 (10.5)[b]	39.5 (9.0)[a]	0.008
Change	17.0 (12.8)[a]	13.8 (11.9)[a]	11.3 (13.0)[b]	0.005
Social functioning				
Preoperative	41.8 (11.2)[a]	44.7 (11.9)[a]	41.4 (12.0)[a]	0.225
Change	11.1 (11.1)[a]	8.6 (11.4)[a]	8.8 (10.5)[a]	0.291
Role-emotional				
Preoperative	46.0 (12.0)[a]	49.2 (9.6)[a]	44.5 (10.7)[a]	0.04
Change	7.0 (11.7)[a]	4.3 (9.8)[a]	6.1 (10.0)[a]	0.438
Mental health				
Preoperative	49.0 (9.2)[a]	50.4 (9.4)[a]	50.4 (7.5)[a]	0.586
Change	7.0 (8.6)[a]	5.4 (9.7)[a]	1.3 (9.0)[b]	0.008
Physical component summary				
Preoperative	32.7 (10.3)[a]	37.7 (10.2)[b]	32.9 (10.8)[ab]	0.009
Change	19.5 (9.3)[a]	16.1 (9.6)[a]	16.2 (10.9)[a]	0.136
Mental component summary				
Preoperative	49.6 (10.5)[a]	52.2 (10.1)[a]	50.0 (8.7)[a]	0.286
Change	5.6 (10.5)[a]	3.4 (10.3)[a]	0.5 (8.5)[b]	0.008

Across preoperative and 1-year change rows, values with different superscript letters indicate significant differences ($P < 0.05$) between groups based on *post hoc* Bonferroni-corrected contrasts. *P* values for SF-36 HRQoL change scores adjusted by corresponding preoperative SF-36 values, preoperative BMI, age, sex and ethnicity.

($F = 4.9$; $P = 0.009$) and the role-physical ($F = 6.5$; $P = 0.002$) and vitality ($F = 4.9$; $P = 0.008$) domains. Participants in the *Active/Active* group also reported higher preoperative scores on the physical functioning domain than *Inactive/Active* participants ($F = 6.1$; $P = 0.009$). Both *Inactive/Active* and *Active/Active* participants reported greater preoperative to postoperative improvements than *Inactive/Inactive* participants on the MCS measure ($F = 5.7$; $P = 0.004$) and the general health ($F = 4.9$; $P = 0.009$), vitality ($F = 5.5$; $P = 0.005$), and mental health ($F = 4.9$; $P = 0.008$) domains, adjusting for differences in preoperative HRQoL values, BMI, age, sex, and ethnicity.

Relationship between PA changes and weight loss and HRQoL improvements

Results indicated a small but significant relationship between increases in PA and weight loss ($\rho = -0.15$; $P = 0.037$) among all study participants ($n = 190$). Significant associations between PA changes and improvements on the SF-36 physical and MCS scores were not observed.

DISCUSSION

This study is the first to prospectively observe a positive relationship between changes in PA and improved bariatric surgery outcomes. Participants who went from being inactive to becoming

active at 1 year after surgery (*Inactive*/*Active*) lost an additional 6 kg, reduced their BMI by two more units, and lost 8 % more of their excess weight compared to those who remained inactive after surgery (*Inactive*/*Inactive*), independent of the effects of age, sex, ethnicity and preoperative weight or BMI. In addition, *Inactive*/*Active* participants and those who reported being active at both time points *(Active*/*Active*) reported greater improvements in overall mental HRQoL and specific HRQOL domains related to broad health concerns (general health), energy level (vitality) and depression and anxiety symptoms (mental health), compared with *Inactive*/*Inactive* participants.

Of those participants who were inactive before surgery, more than two thirds (68%) reported becoming active at 1 year after their surgery. Changes in PA within this group were marked, with PA duration (which includes walking and sums across leisure, occupational, transportation and household activity) increasing from an average of 63 min per week (or <10 min per day) before surgery to 846 min per week (or 2 h per day) after surgery. These findings concur with previous studies showing substantial preoperative to postoperative increases in amount of self-reported PA in a subset of bariatric surgery patients (9,12). However, the level of postoperative PA reported by *Inactive*/*Active* participants was considerably higher than that reported by participants in these former studies (~120 vs. 47 min per day). The current study is one of the first to have used the IPAQ, a standardized measure, which captures changes in PA performed across all contexts of daily life. In addition, given that males are more likely than females to report higher levels of PA (27), the relatively higher percentage of male *Inactive*/*Active* participants (20%) compared with the previous studies (M = 11%) (9,12) may also account in part for differences in reported PA. Nonetheless, this discrepancy highlights the need for future research to determine whether high PA levels are observed in different patient samples using the IPAQ, similar questionnaires, and/or objective PA measures.

Nearly a third (32%) of participants in the present study did not alter their initial lower levels of PA postoperatively (i.e., *Inactive*/*Inactive*), accumulating fewer than 10 min of PA per day at both time points. Interestingly, however, this group could not be distinguished from the *Inactive*/*Active* group with respect to demographics, weight characteristics, PA patterns or HRQoL at baseline. Future studies should focus on identifying factors that can target those individuals who are likely to remain inactive after surgery and might require additional intervention to increase their level of PA.

Research indicates that higher levels of PA are required to improve and maintain significant weight losses (19–21). In the current study, however, comparison of *Active*/*Active* participants with either *Inactive*/*Active* or *Inactive*/*Inactive* participants failed to yield significant differences in weight loss outcomes, despite *Active*/*Active* participants' significantly higher postoperative activity levels. The absence of group differences may owe to the *Active*/*Active* participants' smaller increase in level of PA (from 835 to 1,244 min/week) compared to the 13-fold increase in the *Inactive*/*Active* group (63 to 845 min/week). Similar findings have been reported from the Aerobics Center Longitudinal Study; participants with high baseline PA levels who maintained or slightly increased their activity level gained weight over a 5-year follow-up period, whereas those who had lower baseline PA levels and increased their activity to a moderate or high level, lost weight. Moreover, similar to our findings, comparison of participants who maintained a high activity level with those who maintained a low activity level revealed no significant differences in weight gain (28). These data suggest that it is the magnitude of preoperative to postoperative increase in PA that may be most important for increasing the amount of weight loss produced by bariatric surgery.

Although excluded from formal analyses, ~5% (n = 9) of the original sample went from being active preoperatively to being inactive postoperatively. PA changes in this group were substantial, decreasing on average from 471 min per week (or 67 min per day) before surgery to 64 min per week (or 9 min per day) at 1 year postoperatively. While we cannot explain this large decrease, it is possible that their older age (51.8 ± 12.5 years), health problems or surgical complications (not assessed in this study) may have contributed (27,29).

We also evaluated whether changes in PA across pre to postoperative time points contributed to variation in HRQoL. Improvement in HRQoL along with weight loss and resolution of comorbidities is regarded as one of the primary aims of bariatric surgery (30). Results showed that the *Inactive*/*Active* and *Active*/*Active* groups reported greater improvements on the MCS score and several individual domains including general health, vitality, and mental health, compared with the *Inactive*/*Inactive* group, suggesting that becoming active or continuing to be active after bariatric surgery is associated with greater improvements in subjective mental health status. Our findings correspond with prior studies in nonobese populations showing that increases in PA are more strongly associated with improvements in mental HRQoL than in physical HRQoL (31,32). Future studies that assess HRQoL changes in bariatric surgery patients should incorporate obesity-specific measures that may be more sensitive to changes in HRQoL (33).

Although we found that patients who become more active have better weight loss and improvements in HRQoL than those who remain inactive, the direction of causality cannot be determined. Future research studies in which inactive patients are randomly assigned to interventions to increase their PA or to control interventions are needed to determine whether becoming active actually produces the improvements in outcomes observed in this study. Moreover, given that HRQoL improvements are shown to gradually diminish after the initial postoperative year (3), more long-term prospective studies are needed to evaluate whether HRQoL improvements are better maintained in individuals who continue to be active beyond this initial active weight loss phase vs. those who become or remain inactive.

This study has several strengths including prospective assessment of nearly 200 bariatric surgery patients over a 1-year period. Moreover, previous research has examined either the relationship between current PA level and weight

loss outcomes (7,8,10,11), or pre to postoperative changes in PA without consideration of weight loss or other outcomes (9,12,13). This study is the first to evaluate the importance of preoperative to postoperative changes in PA in relation to both weight loss and HRQoL outcomes. Although a strength of this study is the use of a standardized PA measure, use of any self-report measure is subject to self-report bias (34). Moreover, the IPAQ, although tested in the general population, has not been thoroughly evaluated in obese populations (16). Future studies that incorporate objective measures of PA are needed to corroborate these self-report findings. Further research is also needed to determine the impact of exercise intensity on long-term maintenance of surgical weight loss outcomes. Although current PA guidelines for weight loss maintenance and prevention of weight regain largely emphasize moderate-intensity PA (19,20), lesser amounts of more vigorous activity may be sufficient to achieve successful weight maintenance (35).

In summary, individuals who progressed from being inactive before bariatric surgery to being highly active at 1 year following their surgery had better weight loss outcomes than those who continued to be inactive after their surgery. Individuals who became or continued to be highly active after surgery had greater improvements in mental HRQoL than those who remained inactive postoperatively. Future research should focus on ways to help individuals who are inactive before bariatric surgery to initiate and maintain higher levels of PA after surgery.

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