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Recommendations for patients in the postoperative period of bariatric and metabolic surgery

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Diploma in Wellness Coaching
Diploma in Cardiorespiratory Rehabilitation
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Disclosure Slide

No conflicts of interest to declare.

1. Physiological changes following bariatric and metabolic surgery.

2. The role of physical exercise and physical activity in a favorable prognosis.

3. Evidence-based recommendations for a better postoperative prognosis after bariatric surgery.

Outline

MUSCLE CATABOLISM

A marked energy and protein deficit together with a decline in mechanical loading due to physical inactivity.

PRE

POST

Caloric deficit + protein deficit + physical inactivity = **muscle mass loss**

400 cal	700 cal	800-900 cal	1000 cal
Liquid diet 3 to 20 days	**Liquid diet 3 to 7 days**	**Pureed diet 2-3 weeks**	**Chopped diet 1 month**	**Soft diet Low-calorie High-protein**




McIver et al., 2012; Formichi et al., 2014; Tamboli et al., 2010; Werling et al., 2015

MUSCLE CATABOLISM

This combination **leads**, from very early stages, **to a negative protein balance** that promotes **muscle catabolism, resulting in accelerated loss of muscle mass, bone mass, and strength.**

PRE **POST**

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MUSCLE CATABOLISM

Therefore, **early intervention** is essential to mitigate these effects and preserve both **body composition and patient functionality.**

PRE

POST

Caloric deficit + protein deficit + physical inactivity = **muscle mass loss**

Protein: 1.1 to 1.5 g /kg ideal body weight (BMI 25) or 60 to 120 g/day based on ideal weight

400 cal	700 cal	800-900 cal	1000 cal
Liquid diet 3 to 20 days	**Liquid diet 3 to 7 days**	**Pureed diet 2-3 weeks**	**Chopped diet 1 month**	**Soft diet Low-calorie High-protein**

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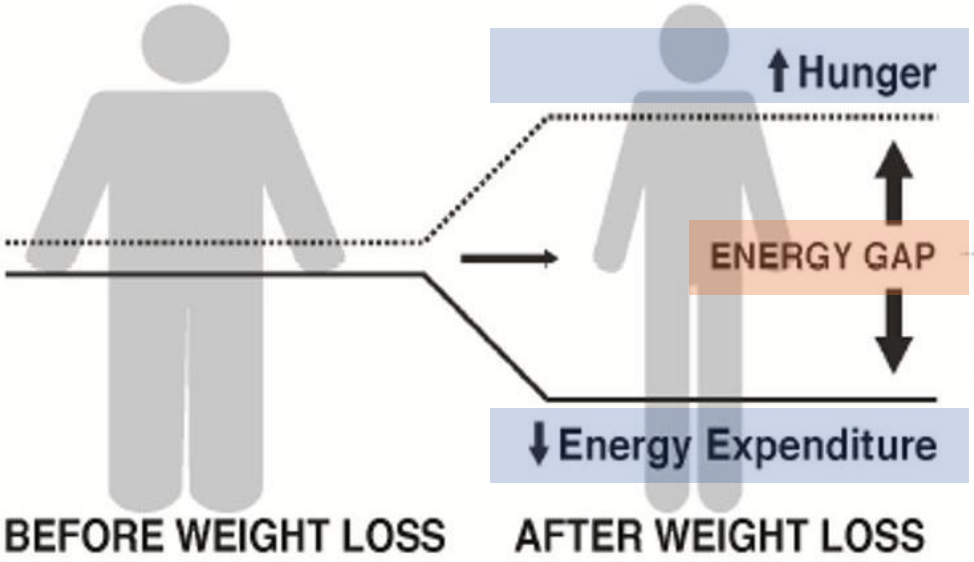


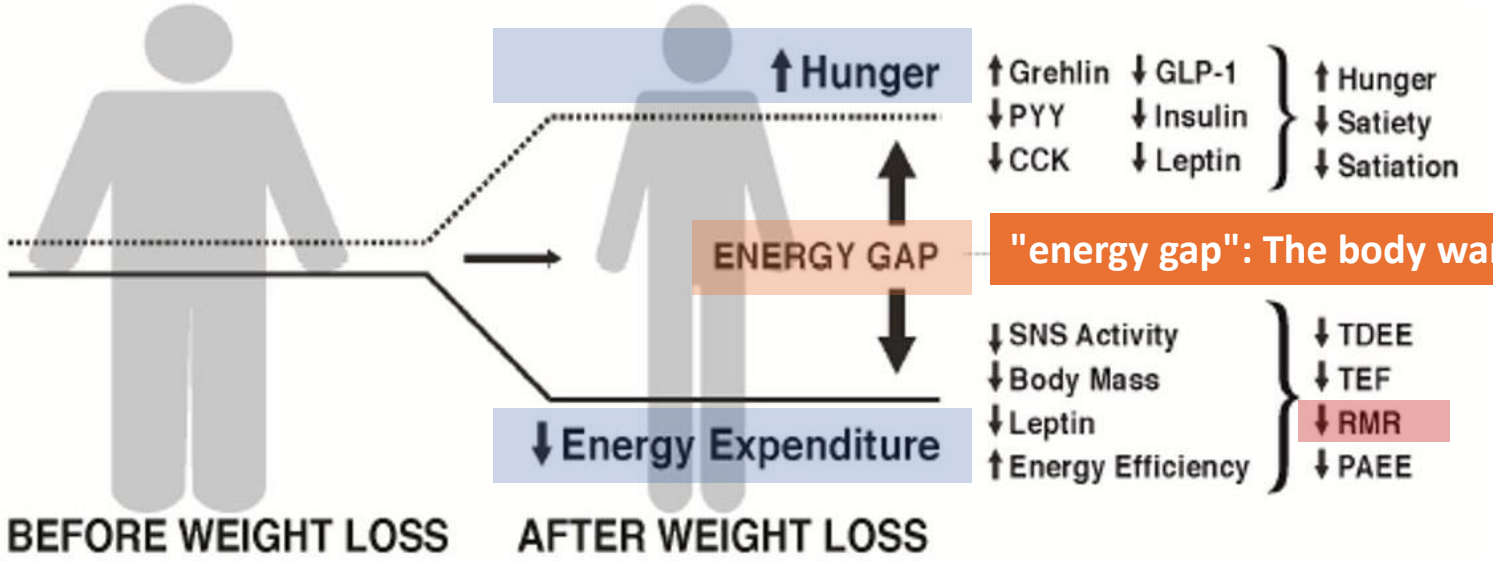
↑Grehlin ↓GLP-1 ↓PYY ↓Insulin ↓CCK ↓Leptin → ↑Hunger, ↓Satiety, ↓Satiation

"energy gap": The body wants more energy than it actually needs

↓SNS Activity, ↓Body Mass, ↓Leptin, ↑Energy Efficiency → ↓TDEE, ↓TEF, ↓RMR, ↓PAEE

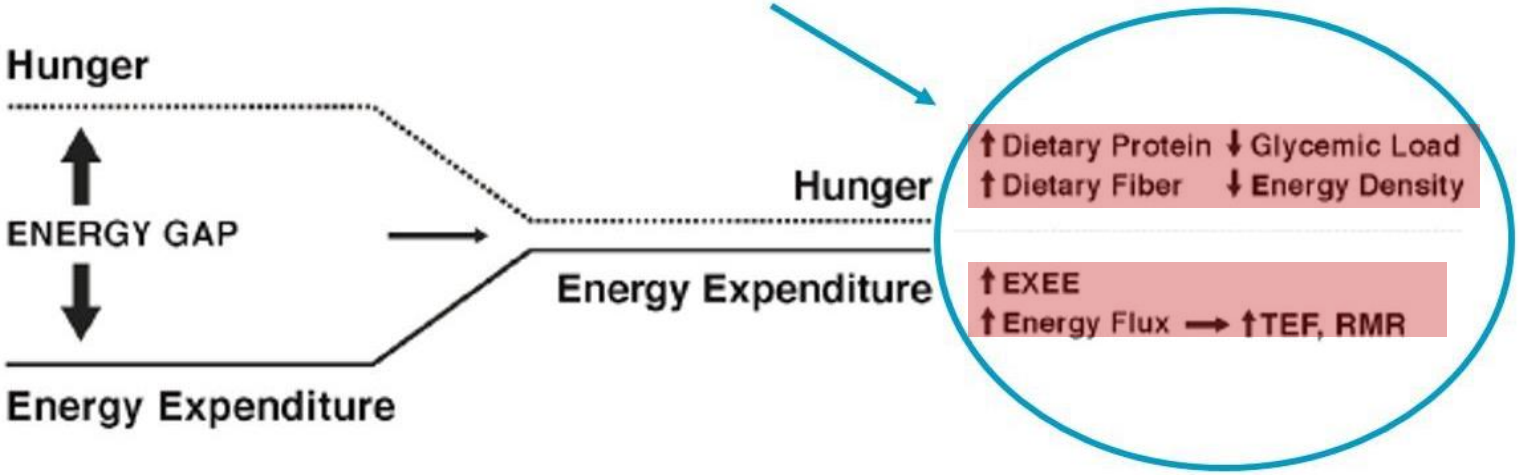
MECHANISMS THAT PROMOTE WEIGHT RECURRENCE

Melby et al, (2017). Nutrients 2017, 9(5), 468

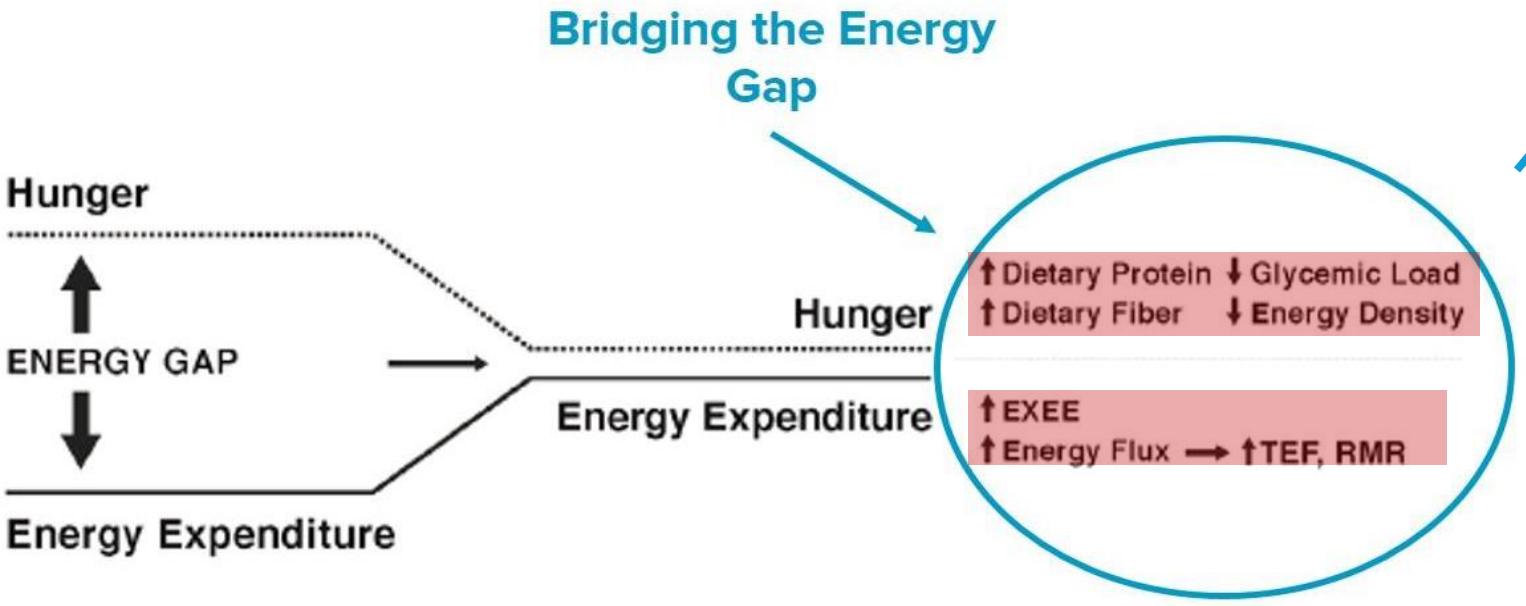


"energy gap": The body wants more energy than it actually needs

Bridging the Energy Gap



STRATEGIES TO REDUCE THIS GAP…



The goal is to create a metabolically active environment to reduce the risk of recurrence.

Melby et al, (2017). Nutrients 2017, 9(5), 468

Up to 49% weight recurrence after bariatric surgery,
observed progressively between **24 months and 5 years post-op**

WEIGHT RECURRENCE

Obes Res Clin Pract. 2023;17(4):345-356

CHANGES IN BODY COMPOSITION

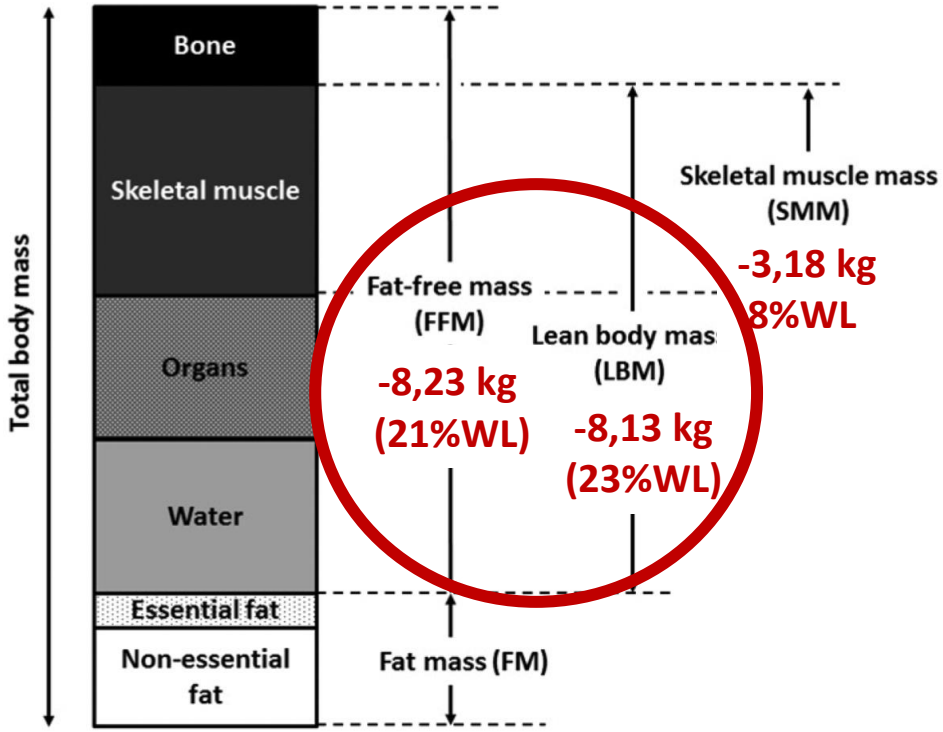
Received: 28 June 2021 | Revised: 9 September 2021 | Accepted: 9 September 2021
DOI: 10.1111/obr.13370

BARIATRIC SURGERY/OUTCOMES

OBESITY Reviews WILEY

The magnitude and progress of lean body mass, fat-free mass, and skeletal muscle mass loss following bariatric surgery: A systematic review and meta-analysis

Malou A.H. Nuijten[1] | Thijs M.H. Eijsvogels[1] | Valerie M. Monpellier[2] | Ignace M.C. Janssen[2] | Eric J. Hazebroek[3] | Maria T.E. Hopman[1]



SR and META-ANALYSIS

Objective: To estimate the magnitude and rate of loss of lean mass, fat-free mass, and skeletal muscle mass following bariatric surgery.

Number of studies included: 59
Total patients: 2,270

Approximately

55% of the total lean mass loss

occurs

in the first 3 months after surgery.

Received: 28 June 2021 | Revised: 9 September 2021 | Accepted: 9 September 2021
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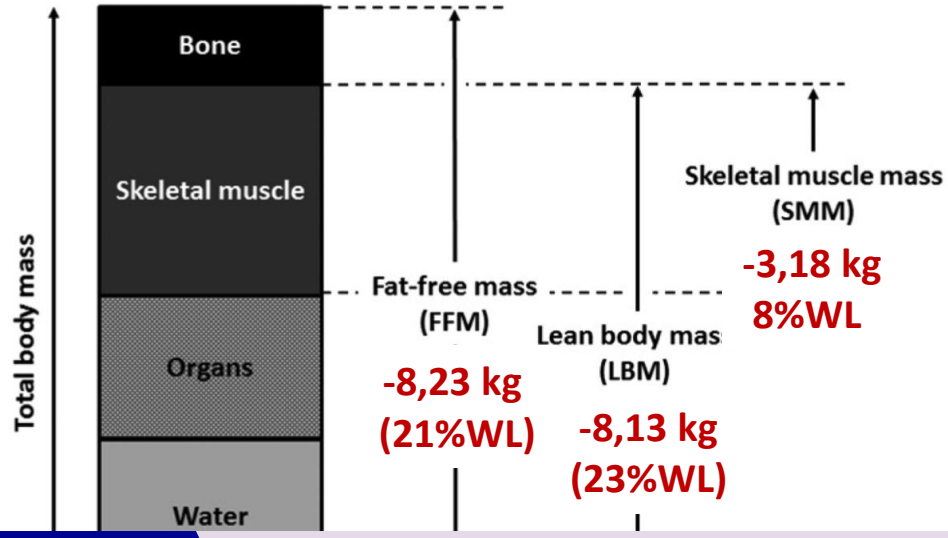

Number of studies included: 59
Total patients: 2,270

Approximately
55% of the total lean mass loss
occurs
in the first 3 months after surgery.

1. Early postop = **most critical phase**
2. **Exercise should start early**
3. **>25% loss (FFM/TW)= undesirable, ↑ sarcopenia risk**

ELSEVIER

Surgery for Obesity and Related Diseases ■ (2022) 1–19

SURGERY FOR OBESITY AND RELATED DISEASES

Review article

Preservation of fat-free mass in the first year after bariatric surgery: a systematic review and meta-analysis of 122 studies and 10,758 participants

Neda Haghighat, Ph.D.[a], Damoon Ashtary-Larky, M.Sc.[b], Reza Bagheri, Ph.D.[c], Ladan Aghakhani, M.Sc.[a], Omid Asbaghi, Ph.D.[d], Masoud Amini, M.D.[a], Nader Moeinvaziri, M.D.[a], Babak Hosseini, M.D.[a], Alexei Wong, Ph.D.[e], Zahra Shamekhi, Ph.D.[f], Fatemeh Jafarian, M.Sc.[a], Seyed Vahid Hosseini, M.D.[g,*]

[a]*Laparoscopy Research Center, Shiraz University of Medical Sciences, Shiraz, Iran*
[b]*Nutrition and Metabolic Diseases Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran*
[c]*Department of Exercise Physiology, University of Isfahan, Isfahan, Iran*
[d]*Cancer Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran*
[e]*Department of Health and Human Performance, Marymount University, Arlington, Virginia*
[f]*Sepidan Bagherololoom Higher Education College, Shiraz University of Medical Sciences, Shiraz, Iran*
[g]*Colorectal Research Center, Shiraz University of Medical Sciences, Shiraz, Iran*

Received 7 September 2021; accepted 21 February 2022

SR and META-ANALYSIS

Objective:
To evaluate the magnitude and progression of fat-free mass (FFM) loss during the first year after bariatric surgery.

Key findings on fat-free mass loss:

- Average monthly loss: **3.47 kg**
- At 3 months: **–5.59 kg** (≈23% of WL)
- At 6 months: **–6.61 kg** (≈22% of WL)
- At 12 months: **–8.34 kg** (≈22% of WL)

Number of studies included: 122
Total patients: 10,758

FFM keeps declining throughout the first year, with no clear plateau

Tolerance to Early and Supervised Physical Exercise After Bariatric Surgery at Clínica INDISA

(preliminary results)

Objective:
To evaluate the tolerance and safety of early, supervised physical exercise in patients after bariatric surgery at Clínica INDISA

Early initiation group (8–15 days post-BS)
n = 27 (77.7% women)
Mean age: 43 y

Late initiation group (30–45 days post-BS)
n = 17 (82.3% women)
Mean age: 41 y

is early exercise safe?

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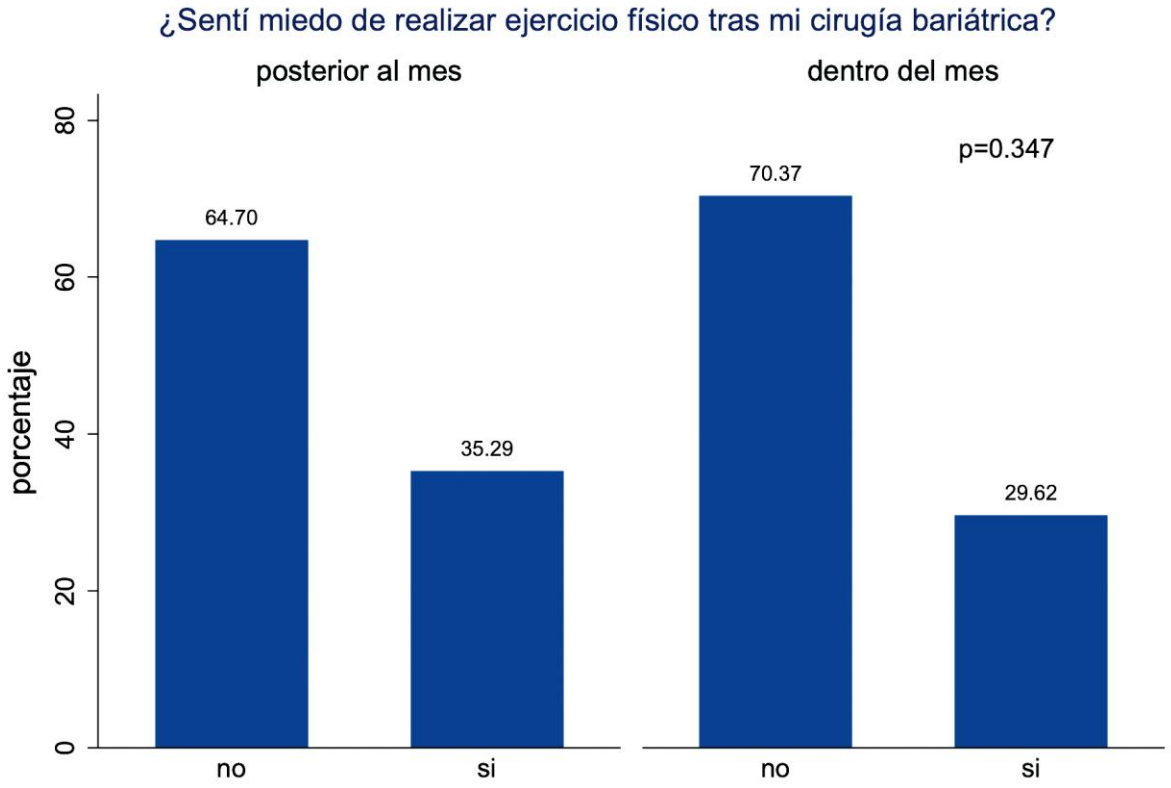
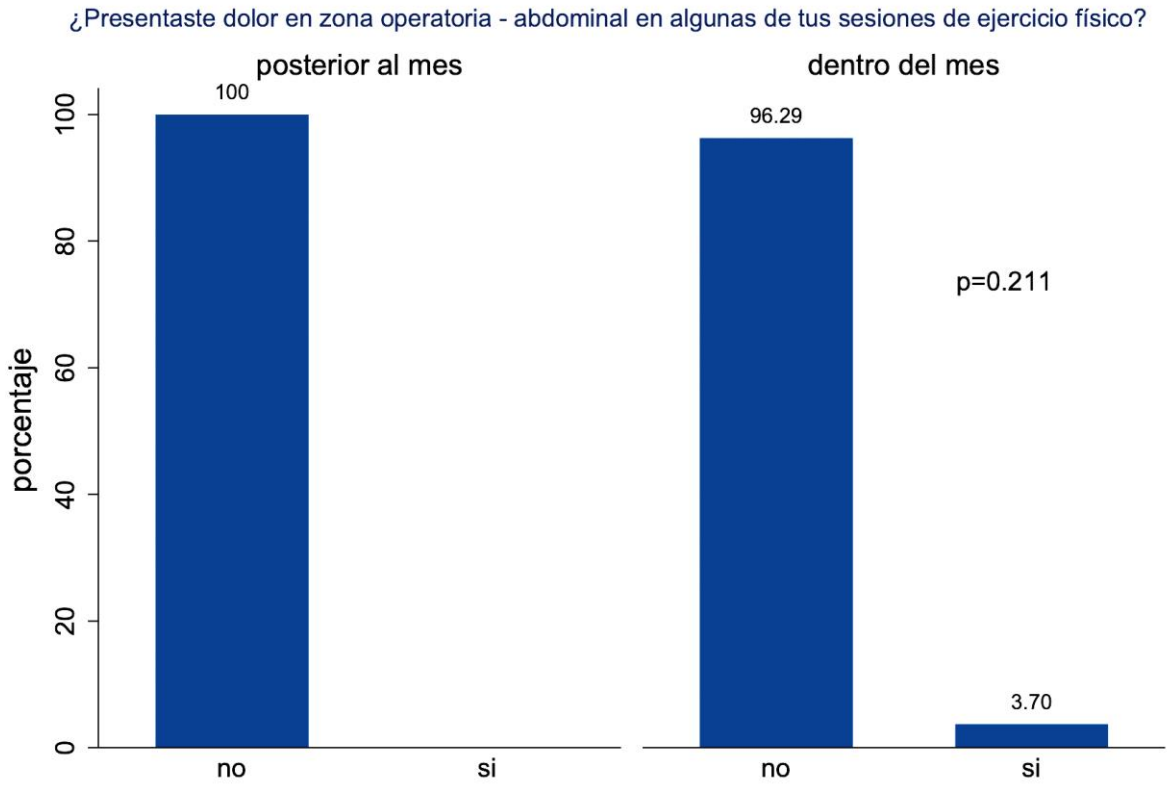


Fear



Pain

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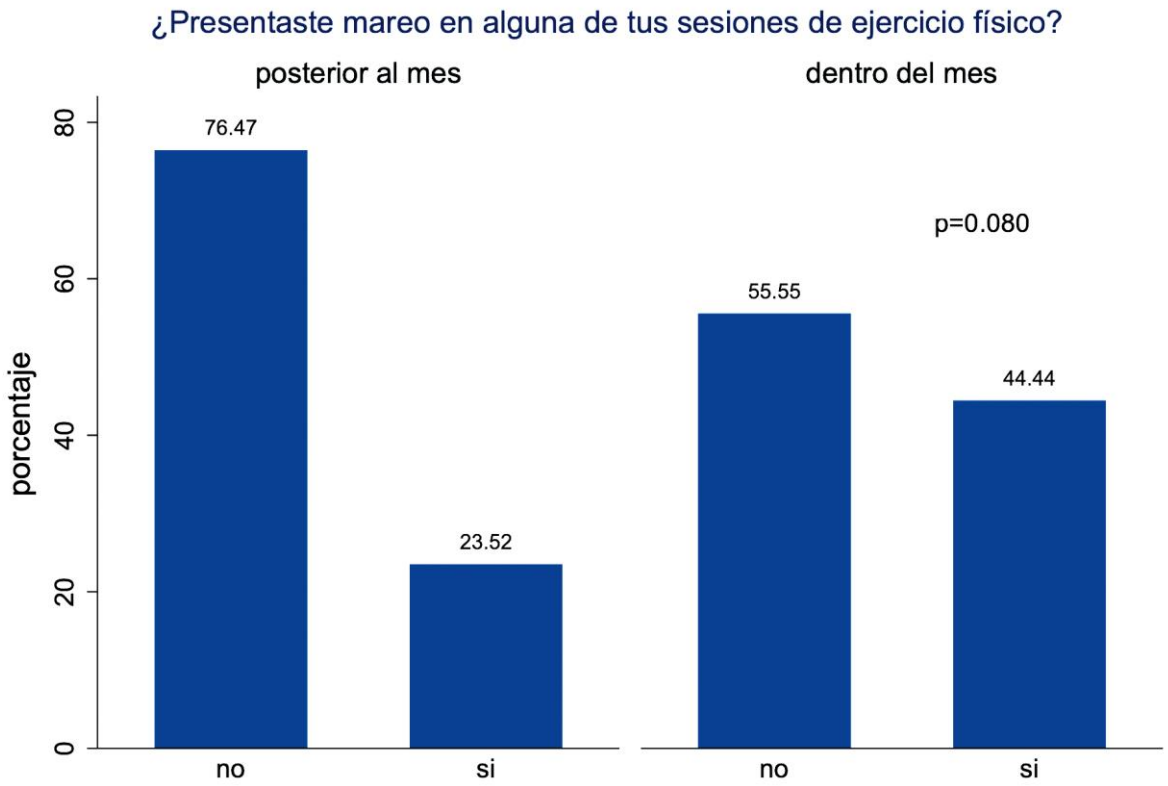
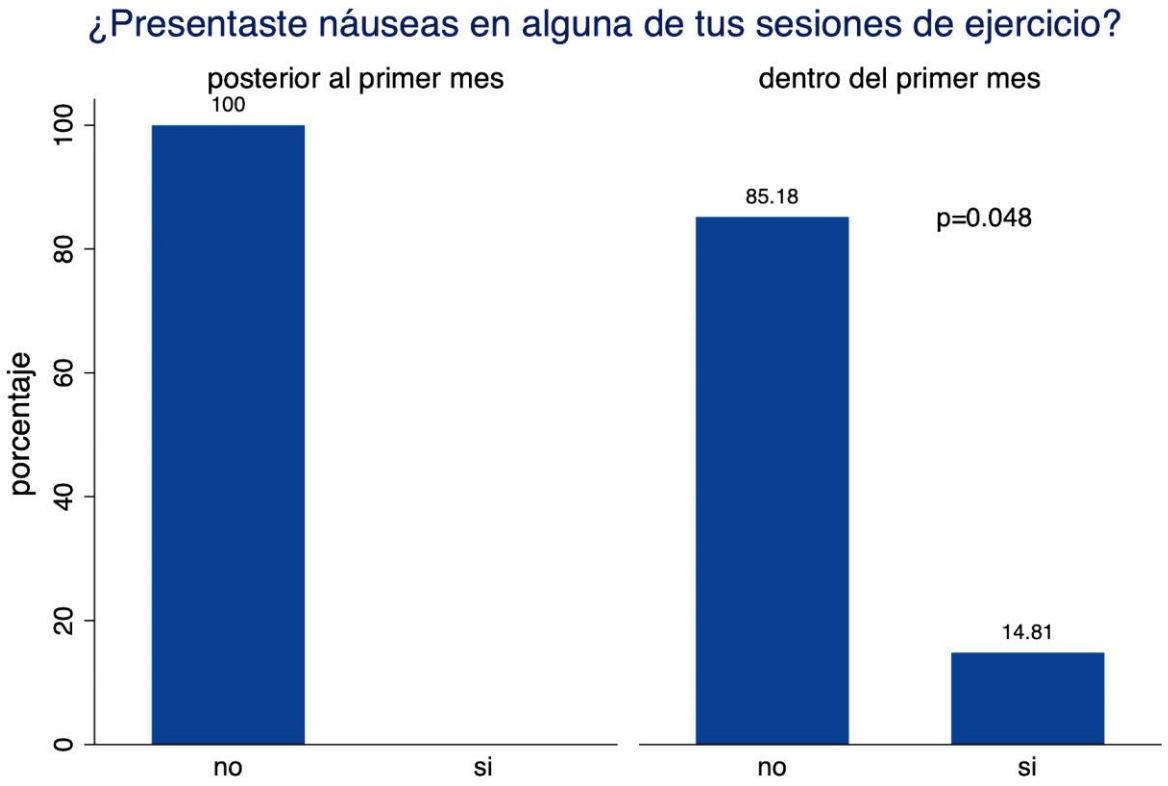


Dizziness



Nausea

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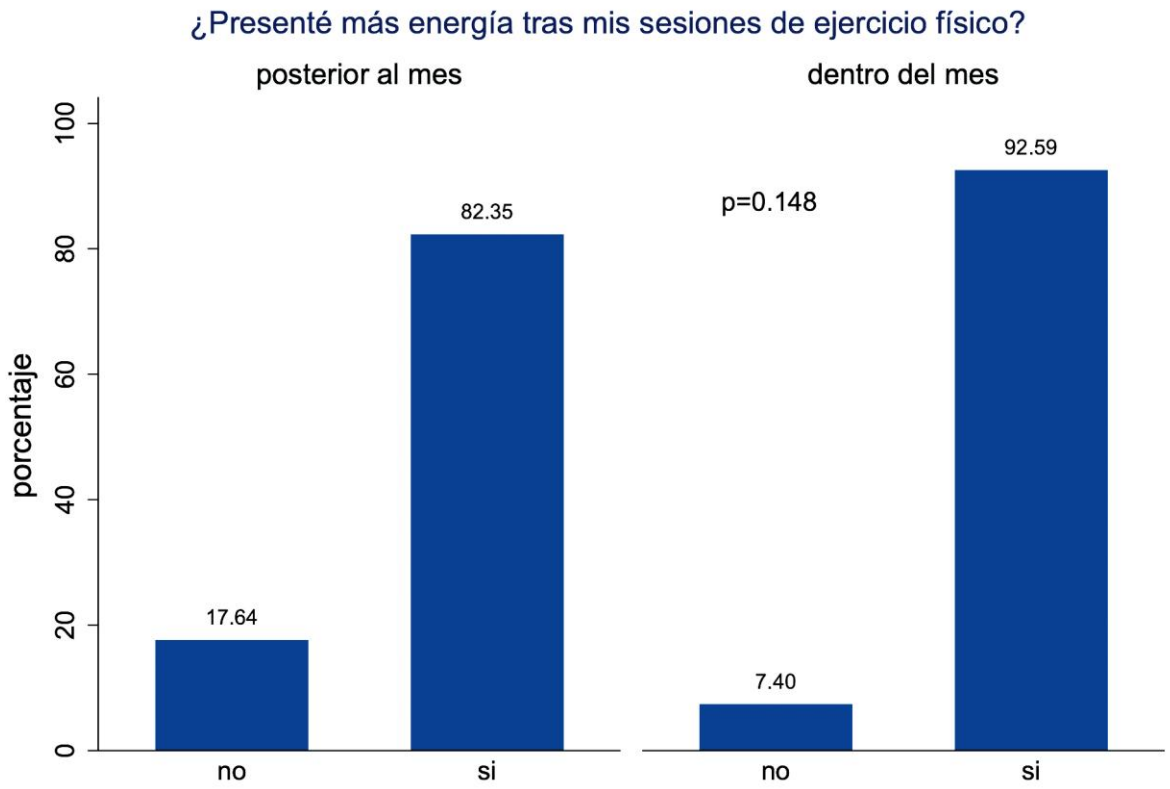
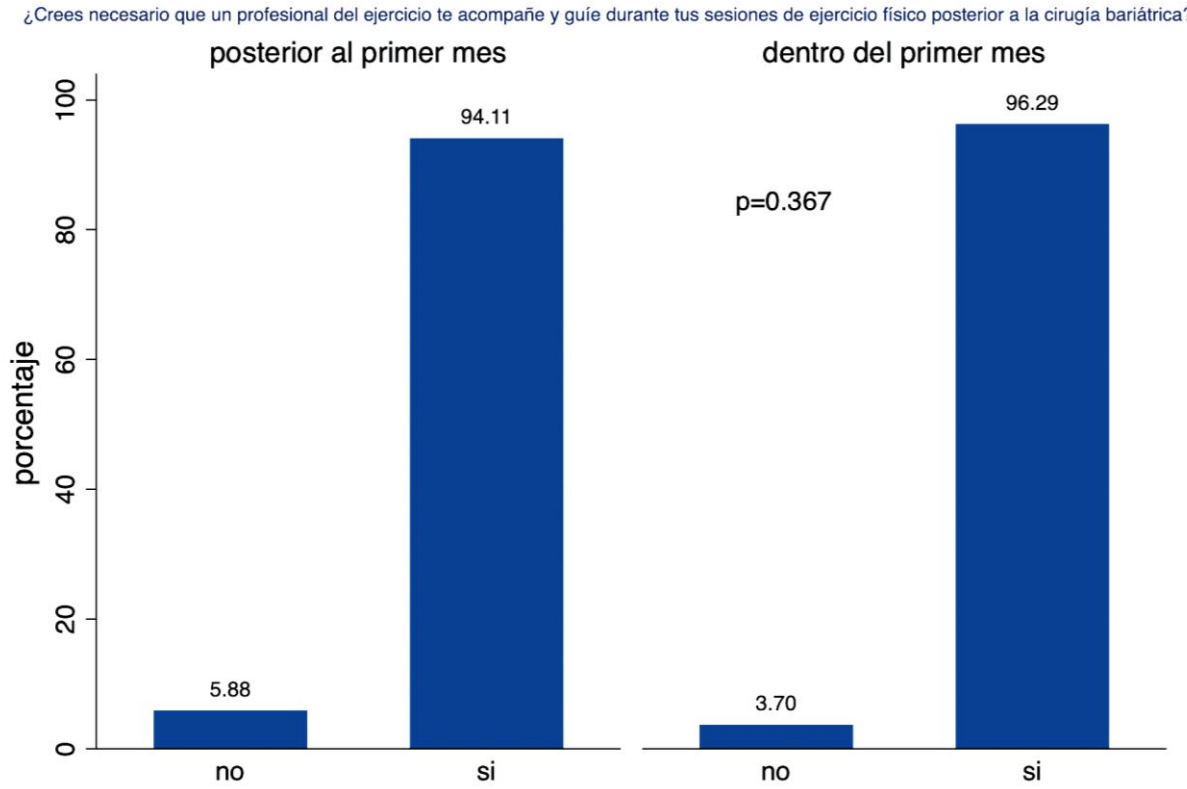


Energy



Professional supervision

Tolerance to Early and Supervised Physical Exercise After Bariatric Surgery at Clínica INDISA

(preliminary results)

Objective:
To evaluate the tolerance and safety of early, supervised physical exercise in patients after bariatric surgery at Clínica INDISA

- Tolerance to supervised physical exercise during the first postoperative month was similar to that observed after one month.
- Early supervised exercise appears safe, well tolerated, and may help minimize deleterious effects of bariatric surgery

SARCOPENIA IN BARIATRIC SURGERY

WHAT DO WE KNOW ABOUT

SARCOPENIA in bariatric surgery?

PREVALENCE

Between 32% and 55%, up to 59%
(Reis et al., 2024; Vassilev et al., 2022)

It depends on the diagnostic criteria
EWGSOP2: 0.7–3.3%
ESPEN/EASO: 7.9–23%
(Vieira et al. 2022)

It varies depending on the method
DXA: 45%, **BIA:** 32%, **Anthropometry:** 18%
(Reis et al., 2024)

PREOPERATIVE SARCOPENIA

Prevalence: 8%
(Voican et al., 2018)

Associated with **longer hospital stays, more postoperative complications, and worse functional prognosis** (Knoedler et al., 2023)

EVALUATION AND DIAGNOSIS

No consensus
(BIA,IME, EWGSOP, FNIH, ESPEN, EASO)
(Seo et al., 2023)

SMI cutoffs
Women: SMI < 38.5 cm^2/m^2
Men: SMI < 52.4 cm^2/m^2
(Voican et al., 2018)

Most sensitive method: D
(Reis et al., 202)

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HOW CAN WE ACCURATELY DIAGNOSE SARCOPENIA IN BARIATRIC SURGERY?

A multifaceted and inclusive methodology for the detection of sarcopenia in patients undergoing bariatric surgery: an in-depth analysis of current evidence

Eunhye Seo[1] · Yeongkeun Kwon[2,3] · Ahmad ALRomi[4] · Mohannad Eledreesi[5] · Sungsoo Park[2,3]

Accepted: 11 December 2023 / Published online: 1 March 2024

Narrative review

Objective: To propose a more comprehensive diagnostic approach for detecting sarcopenia in bariatric surgery, incorporating four dimensions:
muscle mass, quality, strength and function.

1. **Muscle mass: Use BMI-adjusted criteria (such as FNIH)** instead of height alone **to avoid overestimation** → DXA, BIA, CT, or MRI.
2. **Muscle quality: Assess intramuscular fat infiltration** (myosteatosis) via CT, MRI, or ultrasound → Its deterioration is associated with increased metabolic and functional risk.
3. **Strength: Complement with functional tests** (TUG, SPPB, or gait speed) since strength may improve after weight loss without improving muscle quality → Handgrip or 1RM (maximal strength).
4. **Function: Should not be used as a sole criterion** since it improves with weight loss → Sit-to-Stand, SPPB, or gait speed.

PHYSICAL EXERCISE TO PREVENT SARCOPENIA AFTER BARIATRIC AND METABOLIC SURGERY

After bariatric surgery, **structured physical exercise** is essential—being the only intervention that preserves muscle mass, improves strength, and sustains functionality.

Table 4 Evaluation variables and effects of different types of exercise

Measures and results	Number of assessment tools per study	Combined Training	Resistance Training	Aerobic Training
Anthropometry	Scale	(+)(+)(+)		(NA)
	Measuring tape—Waist and hip (4 studies)	(+)(+)	(−)(−)	
	Air displacement plethysmometer (1 study)		(−)	
Body composition	Bioimpedance (8 studies)	(+)(+)(+)(+)	(−)(−)(−)(−)	
	DEXA		(−)	
Associated comorbidities and clinical analysis	Resting Heart Rate, Basal arterial blood (4 studies)	(+)(−)(+)	(−)	(NA)
	Cardiovascular risk score (1 study)	(+)	(NA)	(NA)
Self-reported Quality of life and Inventory Depression	Short-Form Health Survey (SF-36) (2 studies)	(−)	(−)	(−)
	Beck Depression (1 study)	(−)	(NA)	(NA)
Functional capacity	Six-Minute Walk Test (6MWT) (1 study)	(−)	(NA)	(NA)
	Incremental Shuttle Walk Test (ISWT) (1 study)	(+)	(NA)	(NA)
	12 min walking test (1 study)	(+)	(NA)	(NA)
	Sit-to-stand (4 studies)	(+)(−)(−)(+)	(+)	(NA)
Level of physical activity	IPAQ: International Physical Activity (2 studies)	(+)(−)	(NA)	(NA)
	Accelerometer (1 study)	(−)	(NA)	(NA)
	Pedometer (1 study)	(NA)	(−)	(NA)
	Calorimetry (1 study)	(NA)	(−)	(NA)
	Self-reported (2 studies)	(−)	(+)	(NA)
Fitness physical	VO_{2max} (3 studies)	(+)	(−)(−)	(NA)
Muscle quality	Magnetic resonance imaging of the right thigh (1 study)		(−)	(NA)
Muscle strength	1 repetition maximum chest press (1 study)	(NA)	(+)	(NA)
	1 repetition maximum leg extension (2 studies)	(+)	(+)	(NA)
	Handgrip (5 studies)	(+)(+)(+)	(−)(−)	(NA)
Perception of exertion	Borg scale (2 studies)	(−)	(NA)	(NA)

(+) significant effect, (−) no significant effect, (NA) not available

COMBINED TRAINING

Reduced waist and hip circumference.

Improved body composition by reducing fat and **preserving muscle mass** (assessed with BIA).

Enhanced functional capacity (12-minute walk test, ISWT, sit-to-stand test).

Increased physical activity levels (IPAQ).

Improved VO_2max and some indicators of cardiorespiratory fitness.

Increased muscle strength (1RM in leg extension and handgrip).

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	DEXA		(−)	
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	Handgrip (5 studies)	(+)(+)(+)	(−)(−)	(NA)
Perception of exertion	Borg scale (2 studies)	(−)	(NA)	(NA)

(+) significant effect, (−) no significant effect, (NA) not available

RESISTANCE TRAINING

Improved functional capacity (sit-to-stand test).

Increased muscle strength (1RM in leg and chest press).

AEROBIC TRAINING

Was not evaluated in isolation in the included studies.

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	Beck I			
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	Increm			
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	Calori			
	Self-re			
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(+) significant effect, (−) no significant effect, (NA) not available

However…

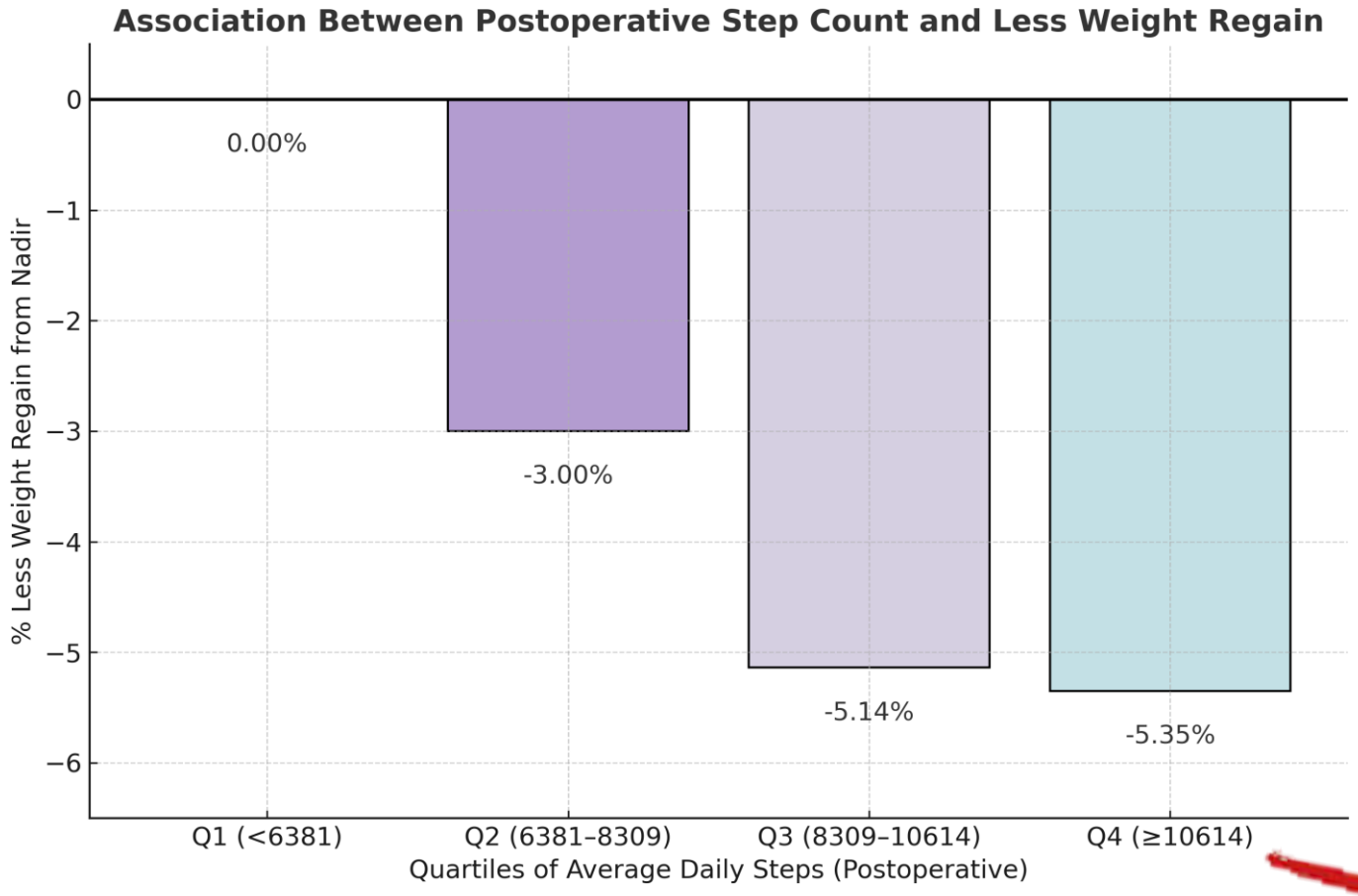
1. Heterogeneity in resistance training

- **Start:** Early (<1 mo) vs Late (>3 mo)
- **Volume:** 1–4 sets, 8–20 reps
- **Intensity:** Highly variable

2. No consensus on optimal parameters

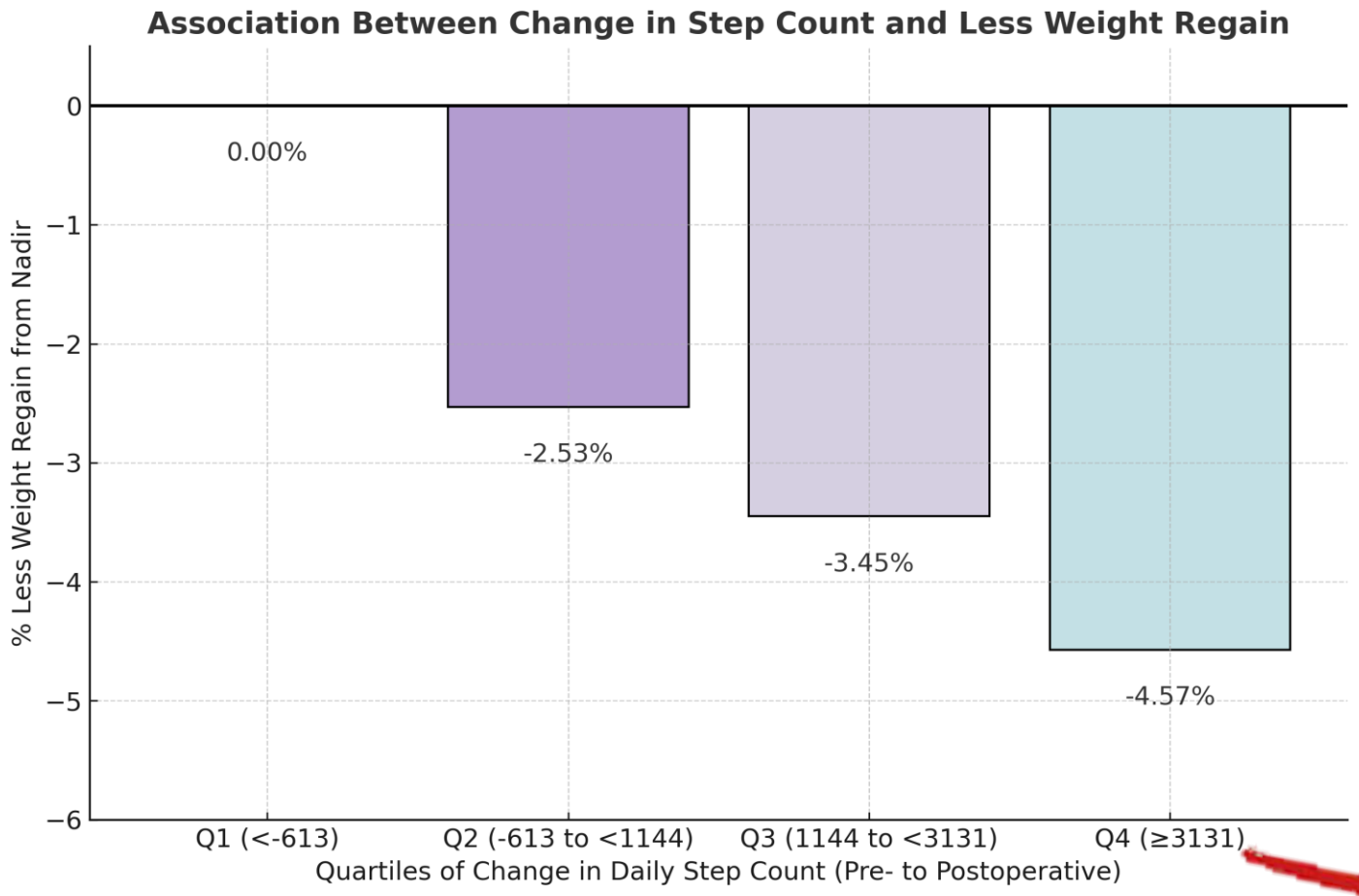
DO HIGHER LEVELS OF PHYSICAL ACTIVITY HELP PREVENT WEIGHT REGAIN AFTER BARIATRIC SURGERY?

Daily Step Changes and Weight Regain 7 Years After Roux-en-Y Gastric Bypass (RYGB)



The most active quartile (Q4) showed **5.4% (95% CI: 2.4–8.3)** less weight regain compared to the lowest activity quartile (Q1).

Changes in Daily Steps and Weight Regain 7 Years After Roux-en-Y Gastric Bypass (RYGB)



The quartile with the greatest increase in daily steps (Q4) had **4.6% (95% CI: 2.4–8.3)** less weight regain compared to the least active quartile (Q1).

ORIGINAL ARTICLE

Associations Between Physical Activity and Changes in Weight Across 7 Years After Roux-en-Y Gastric Bypass Surgery

A Multicenter Prospective Cohort Study

Wendy C. King, PhD,✉ *Amanda S. Hinerman, MPH,* *Gretchen E. White, PhD,‡§ Anita P. Courcoulas, MD,§ Mohammed A. Bu Saad, MD,* and Steven H. Belle, PhD*†*

Although physical activity levels were low, higher daily steps and greater increases from the preoperative period were associated with less weight regain 7 years after RYGB.

Walking more in daily life—beyond structured exercise—may have a clinically relevant impact on preventing weight recurrence.

CLINICAL RECOMMENDATION EVIDENCE

Received: 14 March 2024 | Revised: 16 December 2024 | Accepted: 23 February 2025
DOI: 10.1111/obr.13920

REVIEW

OBESITY Reviews WILEY

Exercise training in metabolic and bariatric surgery: An overview of systematic reviews

Julia Hussien[1] | Marine Asselin[1,2] | Dale Bond[3] | Yin Wu[3] | Valentina Ly[4] | David Creel[5] | Pavlos Papasavas[3] | Bret H. Goodpaster[6] | Aurélie Baillot[1,7,8]

ELSEVIER

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SURGERY FOR OBESITY AND RELATED DISEASES

Review article

Expert-based physical activity guidelines for metabolic and bariatric surgery patients: a systematic review of randomized controlled trials

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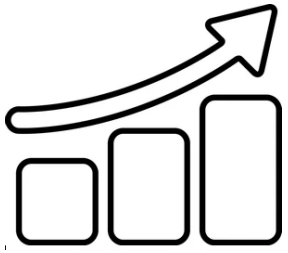
Individualized prescription based on patient functionality and clinical context

Professional supervision to enhance adherence and safety

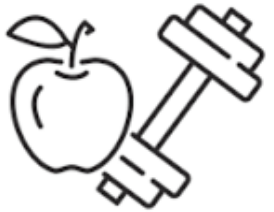
Progression in training is essential



Combined training (aerobic + resistan ce) is most effective

Minimum of 12 weeks required for meaningful clinical benefits

Multimodal approach integrate exercise + nutrition



Key Evidence-Based Recommendations

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REVIEW

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THERE IS STILL MUCH TO BE INVESTIGATED!

What We Still Don't Know

Effects of Exercise Training

Pre MBS Exercise Training

Impact of exercise training on:
- fat mass
- fat-free and lean body mass[a]
- muscle strength
- resting heart rate
- blood pressure
- glucose/lipid metabolism
- physical activity
- adverse surgical events
- hospital stay length

Post MBS Exercise Training

Impact of exercise training on:
- quality of life
- HOMA-IR, HbA1c, insulin sensitivity, AIRg, Di, SPISE and glucose effectiveness

Pre and Post MBS Exercise Training

Impact of exercise training on any variable in the long-term (i.e., > 12 months)

Beneficial Characteristics of Exercise Training Programs

- any beneficial pre MBS exercise training characteristics (e.g., type, start time, duration, time/week) and all beneficial post MBS exercise training characteristics not mentioned in first two columns

Feasibility and Acceptability

- adherence rates to prescribed exercise training programs
- impact of exercise training characteristics (i.e., timing, modality, duration etc.) on feasibility and acceptability outcomes

Conclusions!

1. Early and supervised exercise, combined with adequate nutrition, is safe, effective, and essential for preventing fat-free mass loss after surgery.

2. Interventions must be personalized, progressive, and integrated into an interdisci**pli**nary clinical approach.

3. To ensure long-term sustainability, it is essential to provide continuous counseling, address psychosocial barriers, promote NEAT, and maintain regular clinical follow-up.

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Recommendations for patients in the postoperative period of bariatric and metabolic surgery

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