Does Increasing Exercise & Physical Activity Help to Prevent Recurrent Weight Gain after RYGB?

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[X] I have no potential conflict of interest to report

[ ] I have the following potential conflict(s) of interest to report

IFSO and ASMBS recommend that patients adopt and sustain increases in exercise and physical activity (PA) to prevent recurrent weight gain and return of comorbidities after MBS.

1. **<u>How</u> might increasing PA help prevent recurrent weight gain after MBS?**

2. **<u>Do</u> higher PA levels help prevent recurrent weight gain after MBS?**

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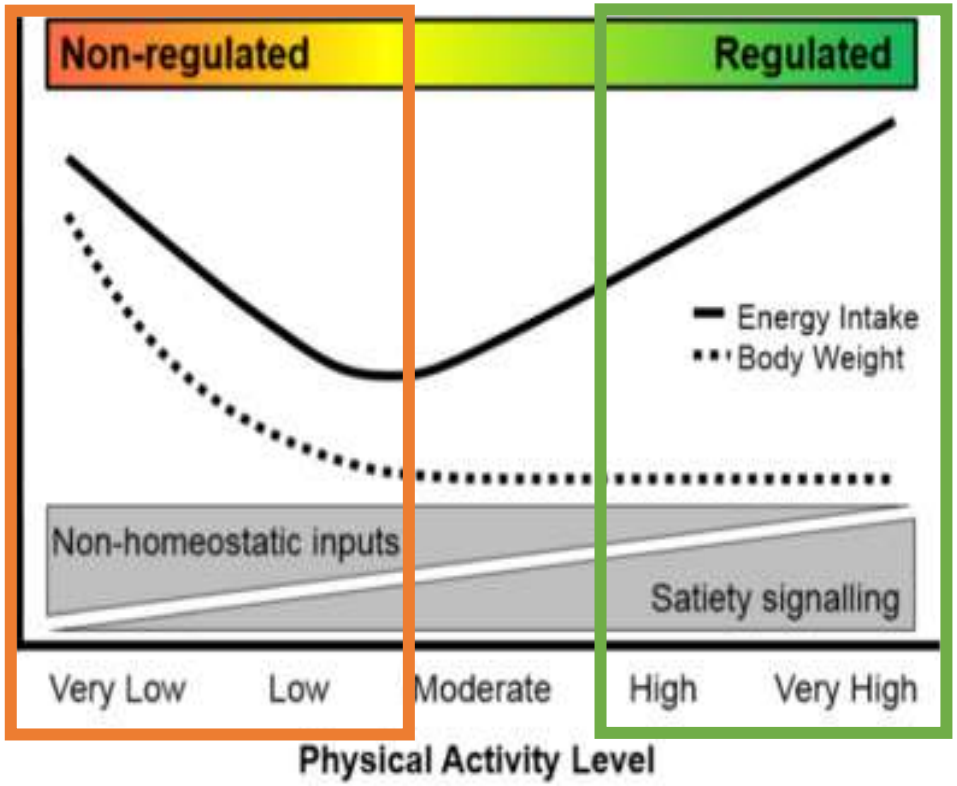
How might increasing PA help prevent recurrent weight gain after MBS? (1)

Updated perspective of appetite control along spectrum of PA levels



Important tenets

- PA = behavioral component of EE
- Appetite = behavioral component of EI
- EI along the spectrum of PA levels is J-shaped
- At higher PA, appetite is regulated via homeostatic (e.g., ↑ satiety signaling) & non-homeostatic mechanisms (e.g., ↓ hedonic hunger)
  - **EE ≈ EI; ↓ body weight; ↓ susceptibility to overeating**
- At lower PA, appetite is dysregulated, body doesn't recognize it is being overfed, & people do not compensate for inactivity by eating less ("energy gap")
  - **EE > EI; ↑ body weight; ↑ susceptibility to overeating**

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Beaulieu, et al. *Physiol Behav* 2018; Blundell & Beaulieu, *Appetite* 2023; Foright, et al. *Physiol Behav* 2018; Melby, et al., *Nutrients* 2017, 2019

How might increasing PA help prevent recurrent weight gain after MBS? (2)

After initial weight loss, there is an energy gap:

- ⇧ hunger & food cravings
- EI desired > EI required
- ⇩ in EE, EE < EI
- ⇧ recurrent weight gain

Higher PA levels

PA narrows energy gap

- Better matching of EI and EE in response to hunger and satiety signals
- Allows ⇧ EI without or less recurrent weight gain

Homeostatic inputs

- ⇧ EE
- ⇧ hunger
- ⇧ satiety signaling
- ⇧ leptin, insulin, & REE
- ⇩ body fat

Non-homeostatic inputs

- ⇩ hedonic hunger
- ⇩ liking of HFHC foods
- ⇩ disinhibition

Regulated appetite

Better EI/EE matching

Weight loss maintenance

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Beaulieu, et al. *Physiol Behav* 2018; Blundell & Beaulieu, *Appetite* 2023; Foright, et al. *Physiol Behav* 2018; Melby, et al., *Nutrients* 2017, 2019

How might increasing PA help prevent recurrent weight gain after MBS? (3)

Associations of MVPA and ST with appetite sensations and eating regulation behaviors in MBS patients

Accelerometry: Continuous daily monitoring of PA & ST

Smartphone EMA: Repeated daily sampling of appetite sensations & eating regulation factors

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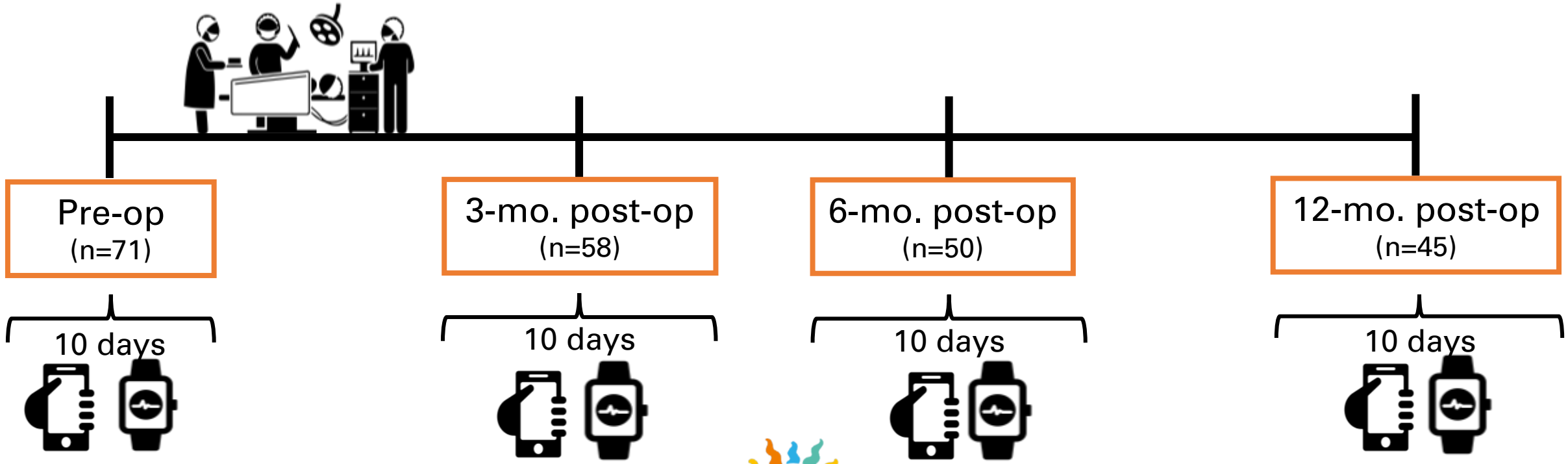
How might increasing PA help prevent recurrent weight gain after MBS? (4)

Associations of MVPA and ST with appetite sensations and eating regulation behaviors in MBS patients (cont.)



Bond, et al., *Obes Sci Pract* 2022

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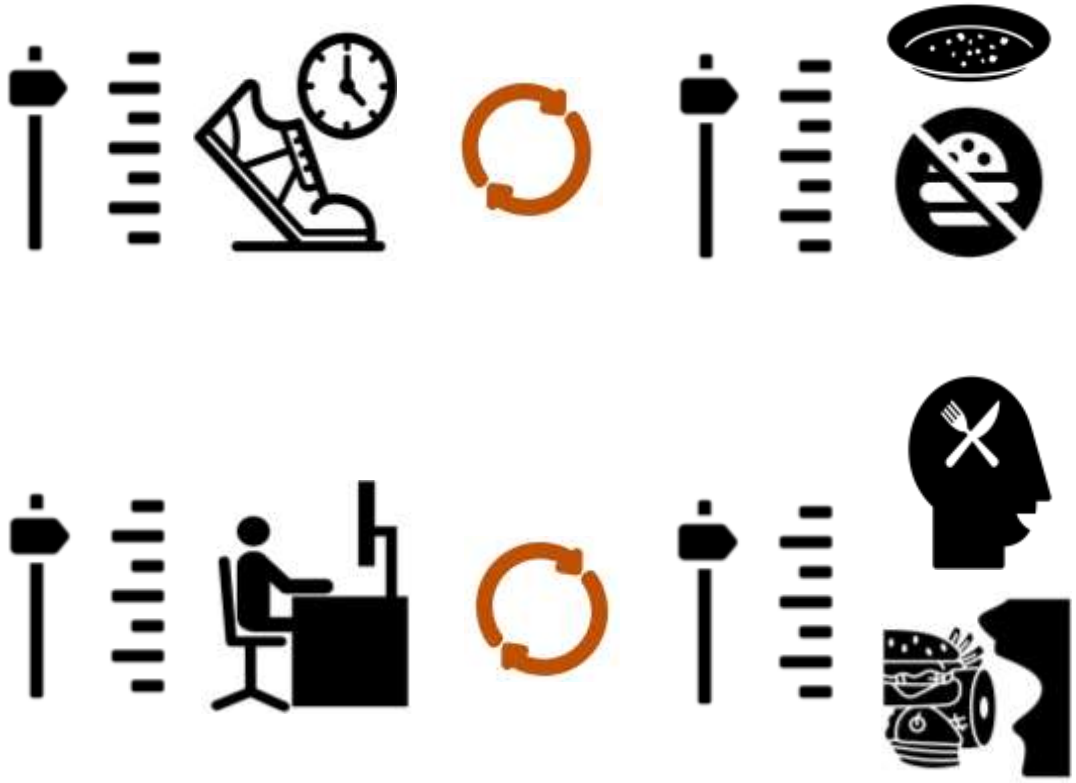
How might increasing PA help prevent recurrent weight gain after MBS? (5)

Associations of MVPA and ST with appetite sensations and eating regulation behaviors in MBS patients (cont.)



- Pts who performed more MVPA had higher satiety levels across time
- Pts who performed more MVPA had higher restraint at 3-mos. post-surgery
- Pts who performed more ST had higher hedonic hunger across time
- Pts who performed more ST had higher disinhibition at 3-mos. post-surgery
- Pts had more homeostatic hunger on days they accumulated more ST than usual

Do higher PA levels help prevent recurrent weight gain after MBS?

Observational Evidence

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Do higher PA levels help prevent recurrent weight gain after MBS? (2)

Overall, MVPA & total PA are associated with less recurrent weight gain after MBS

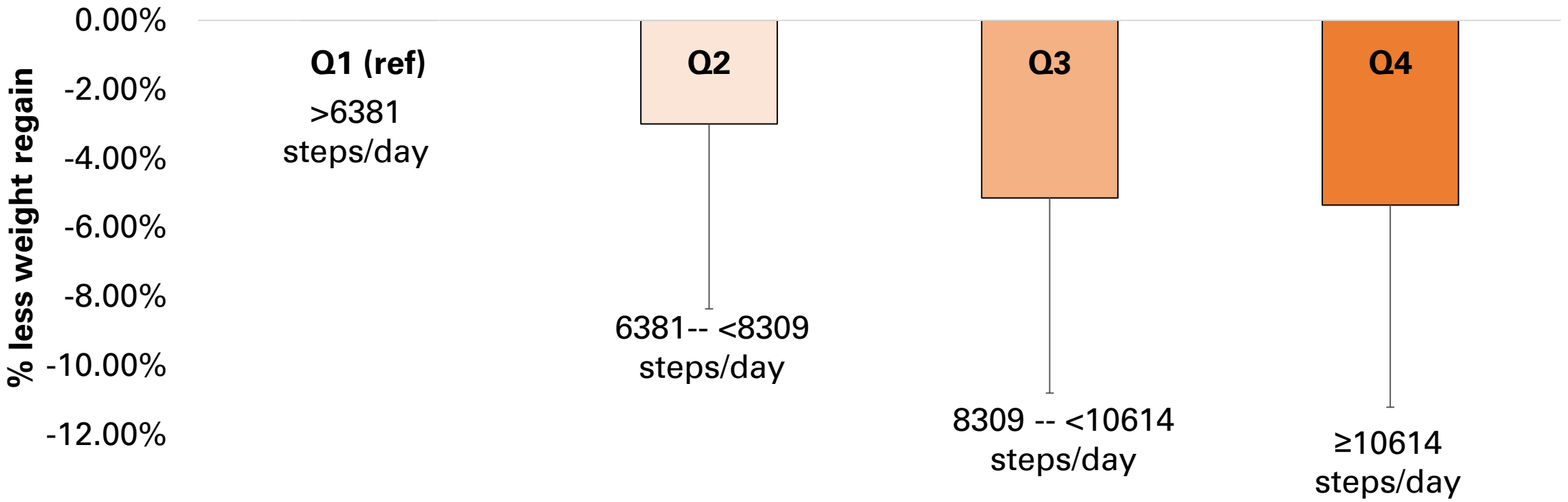
Pts who perform higher levels of MVPA & total PA experience less recurrent weight gain

Lower MVPA & total PA levels are more prevalent among pts with clinically significant recurrent weight gain

Herman, et al. *Obes Surg* 2014; King, et al. *Ann Surg* 2022; Martin-Fernandez, et al. *J Behav Med* 2022; Nymo, et al. *Obes Res Clin Pract* 2022; Shantavasinkul, et al. *Surg Obes Relat Dis* 2021; Romagna, et al. *Obes Surg* 2021

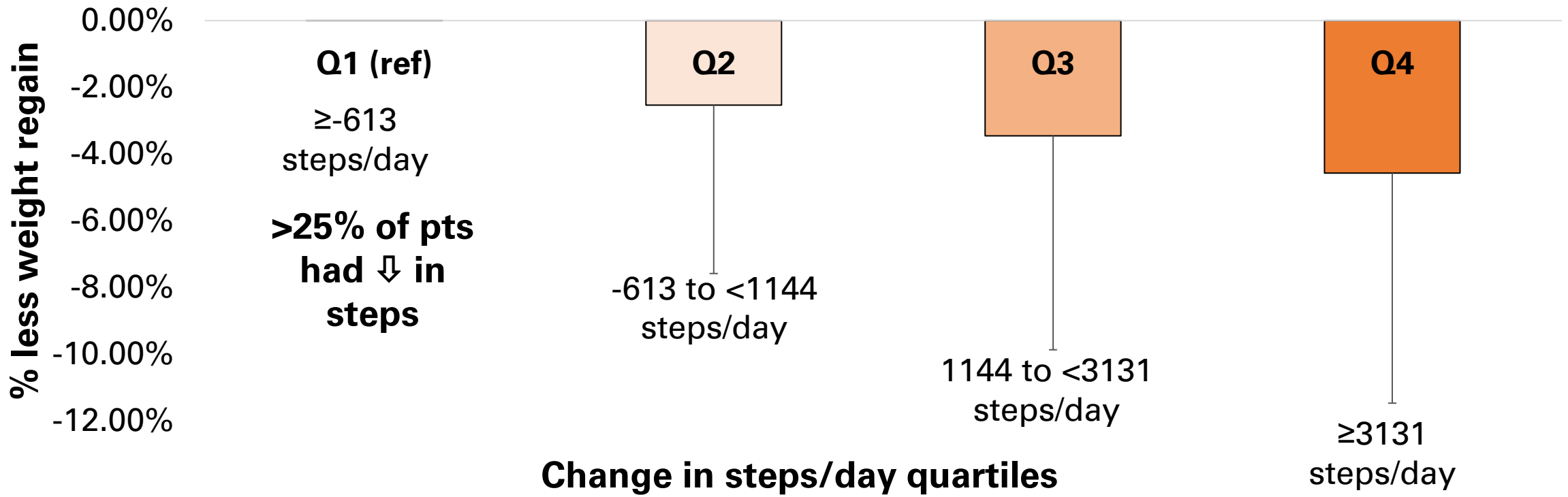
Do higher PA levels help prevent recurrent weight gain after MBS? (3)

Postoperative daily steps & recurrent weight gain over 7 years after RYGB



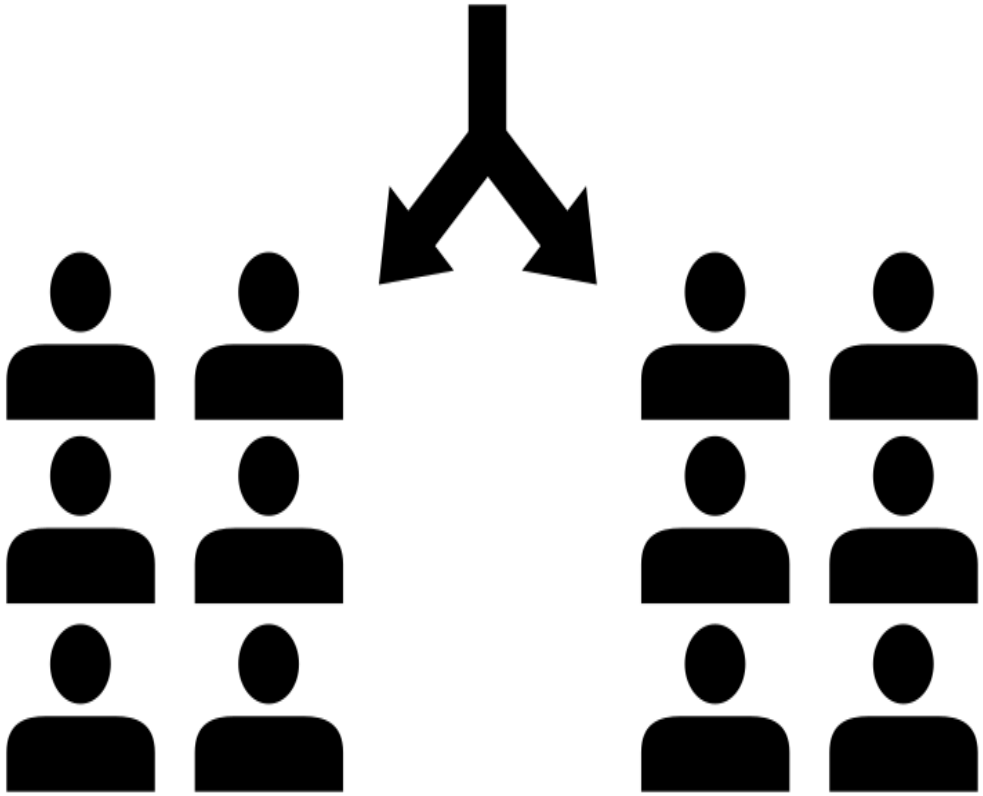
Do higher PA levels help prevent recurrent weight gain after MBS? (4)

Pre- to post-operative changes in daily steps & recurrent weight regain after RYGB



King, et al., *Ann Surg* 2022

Do higher PA levels help prevent recurrent weight gain after MBS?



Experimental Evidence

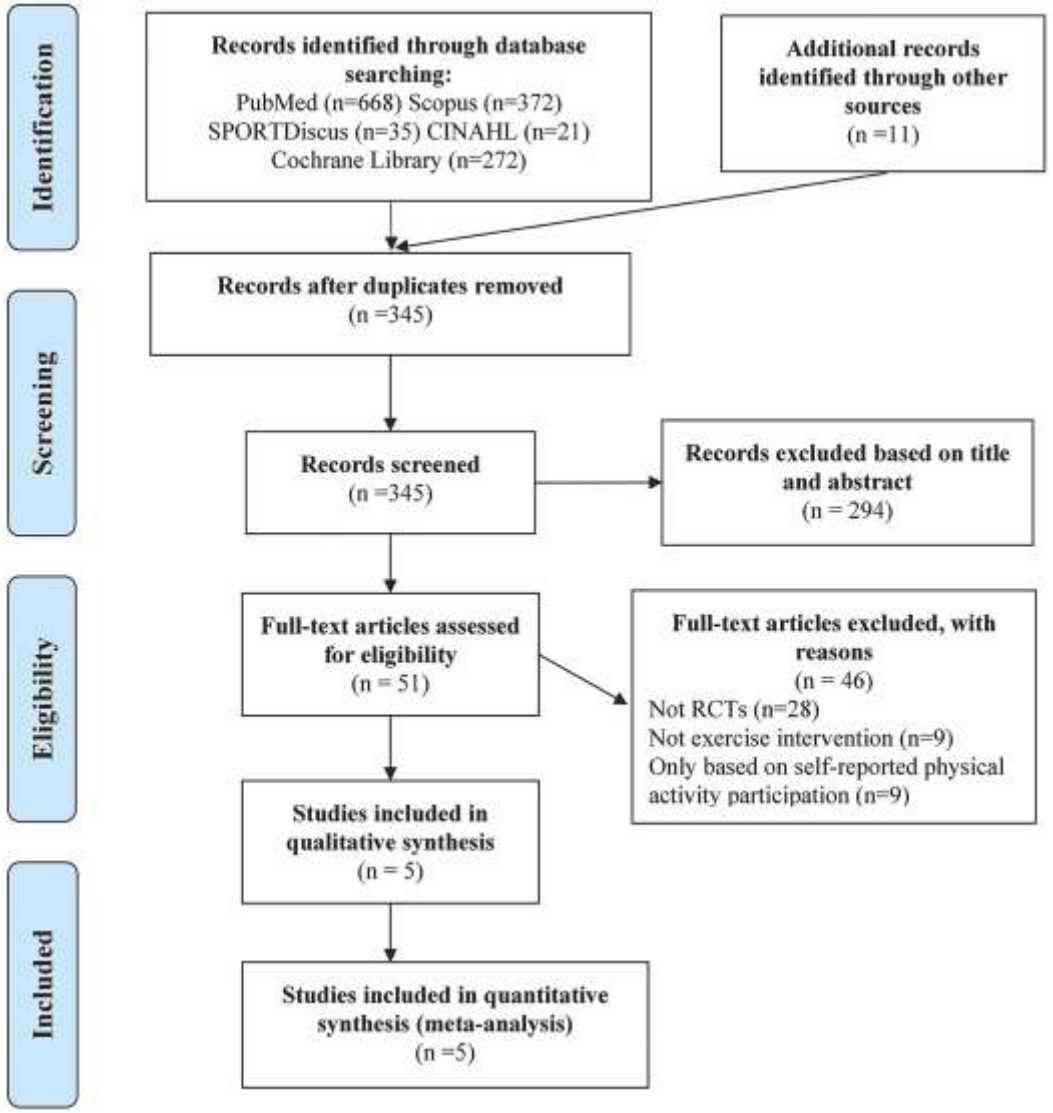
Do higher PA levels help prevent recurrent weight gain after MBS? (5)

- Several RCTs of exercise interventions for MBS patients
- Efficacy of exercise interventions for counteracting recurrent weight gain after MBS had not been systematically evaluated
- MBS teams lack evidence-based information to advise patients on appropriate Frequency, Intensity, Time and Type (FITT) for preventing/reversing recurrent weight gain

Do higher PA levels help prevent recurrent weight gain after MBS? (6)

Exercise for counteracting weight recurrence after bariatric surgery: a systematic review and meta-analysis of randomized controlled trials

- Focused on:
  - Exercise interventions that specified **FITT** (**F**requency, **I**ntensity, **T**ime, and **T**ype) and measured weight > 12-mos. post-surgery
  - RCTs – random assignment to either exercise intervention w/ FITT or non-exercise control
- Of 1368 studies reviewed, 5 met inclusion criteria
  - N=189 (38 ± 17 per study)
  - 83% female
  - Mean age = 47.8±4.2 years old
  - Mean BMI = 36.1±3.8 kg/m2
  - 62% had RYGB



Do higher PA levels help prevent recurrent weight gain after MBS? (7)

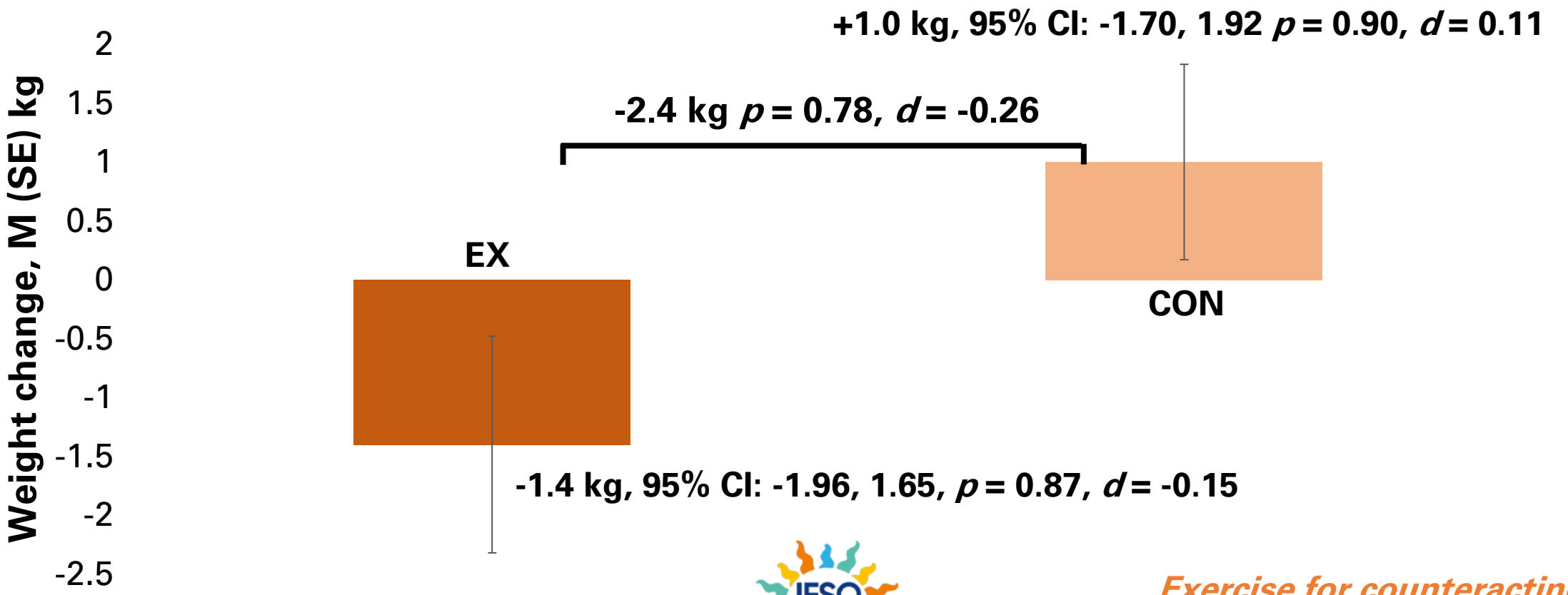
- Interventions (mostly supervised) initiated at 18.9 ±11.5 mos. post-surgery and lasted 19.2±7.0 wks.

- **FITT** characteristics
  - **F**requency: ≤5 days/week
  - **I**ntensity: MVPA
  - **T**ime: 80-210 minutes/week
  - **T**ype: aerobic + resistance exercise

Exercise for counteracting weight recurrence after bariatric surgery (cont.)

Do higher PA levels help prevent recurrent weight gain after MBS? (8)

Weight change within and between EX and CON groups



Exercise for counteracting weight recurrence (cont.)

Do higher PA levels help prevent recurrent weight gain after MBS? (9)

- Low confidence that the observed effect is accurate
  - Small # of trials (n=5)
  - Only 2 trials designed to reduce recurrence of weight gain
  - No information on where pts were in their weight trajectory
    - e.g., weight stable (*prevent recurrent weight gain*) or already regaining (*reverse recurrent weight gain*)
  - Limited data on exercise compliance
  - Misalignment of EX intervention FITT with guidelines for weight management/prevention of weight gain
  - Risk of bias re: randomization, missing data, protocol deviations

Bond, et al. *Surg Obes Relat Dis* 2023; Papasavas & Bond, *Surg Obes Relat Dis* 2023

Should we encourage patients to increase PA levels to help prevent recurrent weight gain?

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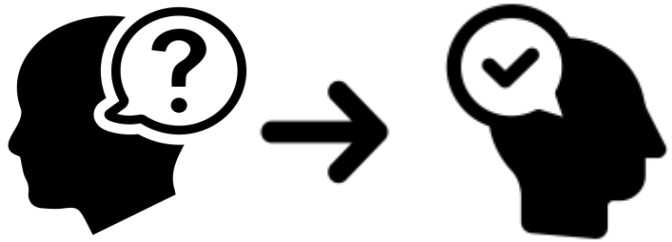

- To leverage PA as a strategy for preventing recurrent weight gain, pts need to increase and sustain higher PA levels
- On average, pts make only modest changes in PA after surgery that reflect PA levels that are far below those recommended
- **MBS appears to have little effect on PA behavior—MBS is not a PA behavior change strategy**
- Need research to understand how to effectively motivate pts to perform PA at higher levels in daily life to prevent recurrent weight gain (supervised exercise/proof-of-concept trials are not enough)
- **AND, finally…**

Berglind, et al. *Obes Surg* 2016; Bond, et al., *Obesity* 2010; *Surg Obes Relat Dis* 2023; King, et al., *Obesity* 2015; *Ann Surg* 2022; Possmark, et al. *BMC Surg* 2020; Sundgot-Bergen, et al. *Int J Obes* 2023

IT IS NOT JUST ABOUT WEIGHT GAIN RECURRENCE—IT IS ABOUT PROMOTING & SUSTAINING OPTIMAL LIFELONG PHYSICAL AND MENTAL HEALTH AFTER A LIFE-SAVING PROCEDURE

- ↑ CR fitness
- ↑ Muscle strength
- ↓ Cardiometabolic risk
- ↓ Bone loss
- ↑ Physical function
- ↑ Body composition
- ↑ Weight loss/↓ weight recurrence
- ↑ Appetite & eating regulation
- ↓ Depression symptoms
- ↑ Energy/vitality

Auclair, et al. *Can J Cardiol.* 2021; Baillot A, et al. *Obes Surg* 2018; Bellicha, et al. *Obes Surg* 2019, *Obes Rev* 2021; Bond, et al. *Obesity* 2015, *Obes Sci Pract* 2022, *Surg Obes Relat Dis* 2023; Boppre, et al. *Obes Sci Pract.* 2021; Carnero, et al. *Obesity* 2017; Coen, et al. *Diabetes* 2015, *J Clin Invest* 2015; Diniz-Sousa, et al. *Obes Surg.* 2022; Herring, et al. *Obes Rev* 2016; King, et al. *Ann Surg* 2022ab, Marc-Hernandez, et al. *Sci Rep.* 2020; Ren, et al. *BMJ Open* 2018; Schumacher, et al. *Obes Surg.* 2022; Woodlief, et al. *Obesity* 2015

ACKNOWLEDGEMENTS

NIH NIDDK

R01 DK108579
(MPI: Bond, Thomas)

R01 DK113408
(MPI: Papasavas, Pearlson)









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Thank you for your attention

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