

The impact of post-operative metabolic adaptation on the long-term weight trajectory after bariatric surgery

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I have no potential conflict of interest to report



Introduction

- Bariatric surgery (BS) is the most effective treatment for severe obesity, but post-operative weight regain (WR) hinders its success in the long term.
- WR after BS has been proposed to be influenced by **biological**, emotional, behavioral, and surgical factors.
- Metabolic adaptation (MA) [which refers to a reduced resting energy expenditure (REE) associated with weight loss not accounted for by changes in body weight or body composition] is a **biological** factor potentially involved in weight trajectory after BS-associated successful weight loss (WL).

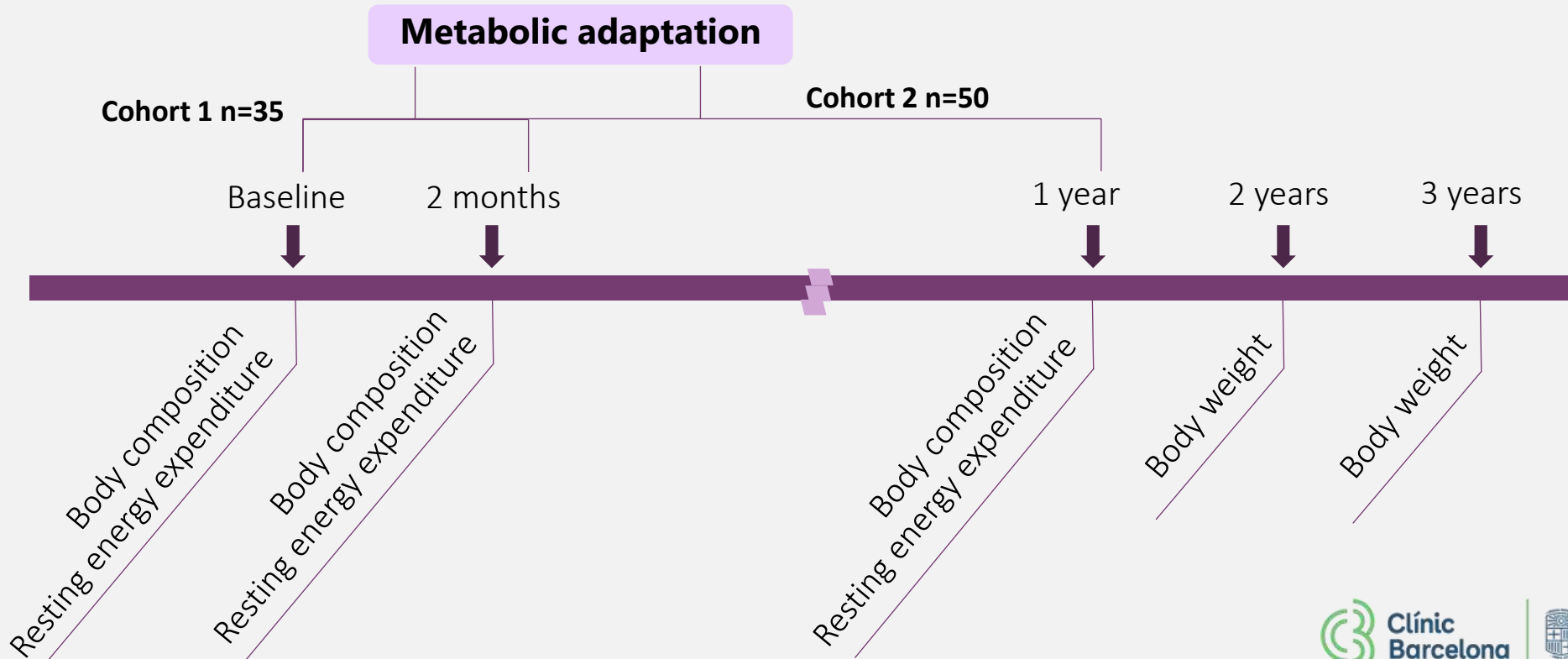
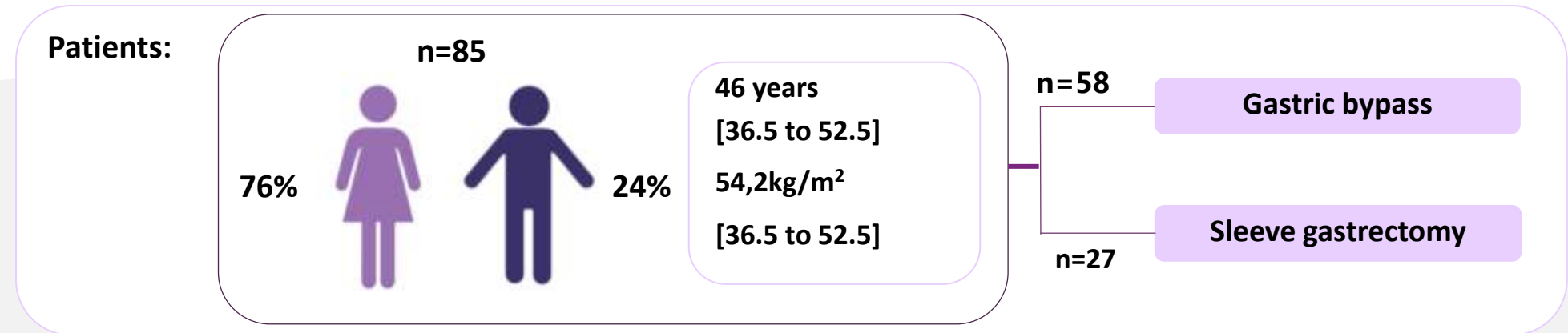
Aims

In bariatric surgery (BS) patients:

- To determine whether MA develops in the short- (2 months) and long- (12 months) term.
- To assess the potential impact of post-surgical MA on the weight trajectory up to 3 years after BS.
- To assess if MA differs following two commonly performed BS procedures [gastric bypass (GBP) and/or sleeve gastrectomy (SG)].



Methods



Methods

- **Body composition** was assessed using bioelectrical impedance analysis (BIA, Tanita BC418)
- **Resting energy expenditure** (REE) was calculated as an average of the last 15-20 minutes of each measurement period if values had reached steady state, defined as <10% fluctuation in minute ventilation and oxygen consumption and <5% fluctuation in respiratory quotient.
- Baseline data from all 85 patients was used to generate a least squares best-fit linear regression equation for REE as a function of FFM, FM, age, and sex ($R^2=0.84$).

$$REE(Kcal/day) = 1001 + 21.2 \times FFM (kg) + 1.4 \times FM (kg) - 7.1 \times age(years) + 276 \times sex (female = 0, male = 1)$$

- We calculated the predicted REE using this equation along with the corresponding FFM, FM, sex and age at each time point for every individual.
- Differences between the measured and predicted REE defined the magnitude of **metabolic adaptation** (MA), which was present if the REE residuals were significantly different from zero.

Results I

Weight trajectories during follow up (FU)

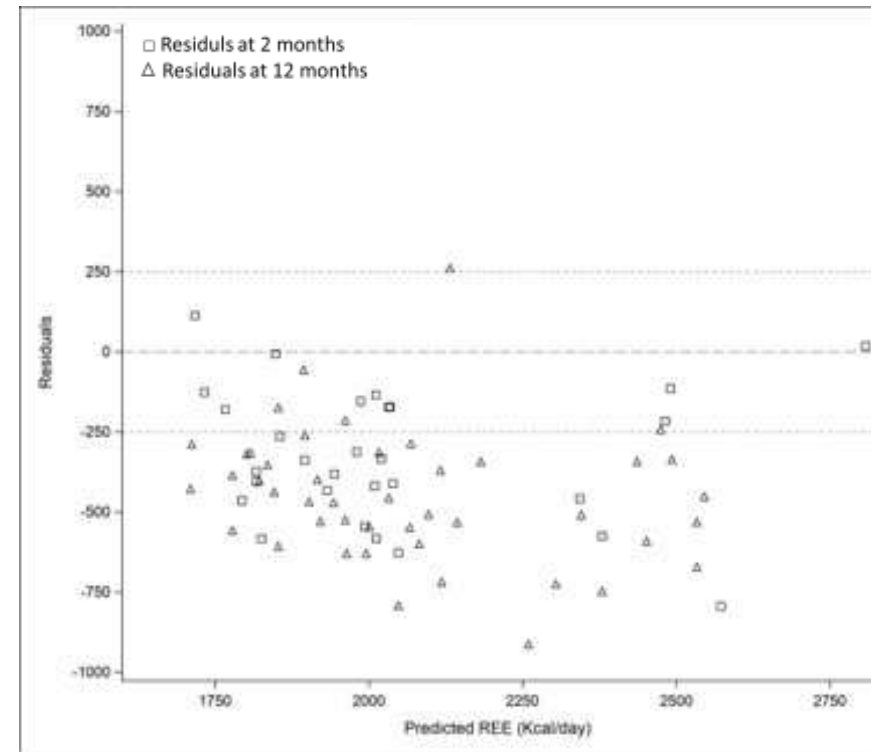
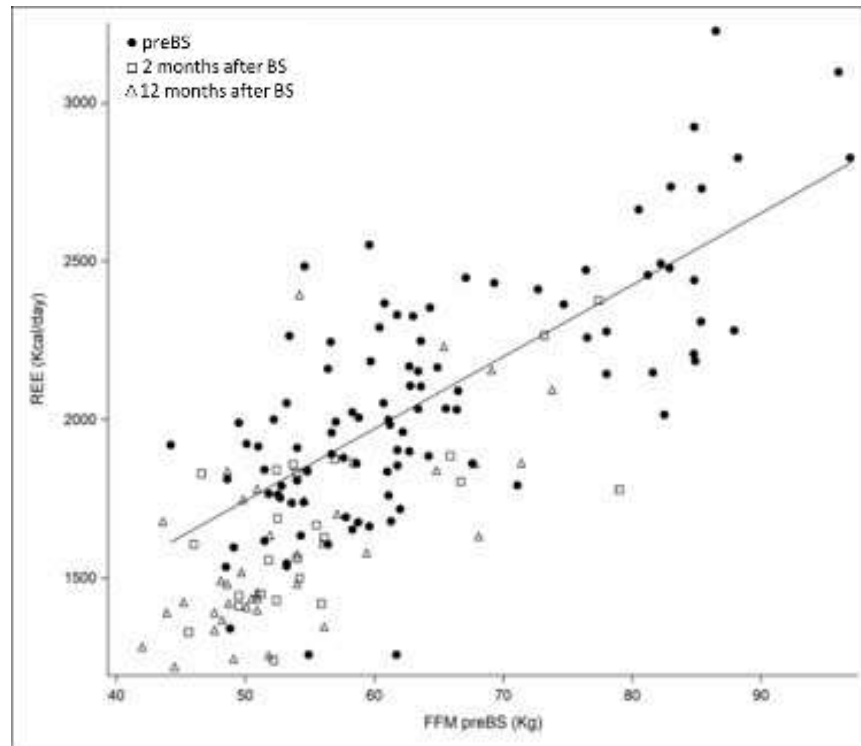
	1 year FU		2 years FU		3 years FU	
	GBP	SG	GBP	SG	GBP	SG
BMI (kg/m²)	29.54 [26.81 - 32.33]	30.08 [25.97 - 33.05]	29.71 [26.58 - 31.91]	29.01 [26.19 - 33.19]	30.57 [28.16 - 33.38]	30.03 [26.96 - 36.34]
BMI difference from baseline (kg/m²)	-15.29 [-18.32 - -12.45]	-16.36 [-19.83 - -14.92]	-15.87 [-19.04 - -12.7]	-16.19 [-21.07 - -14.45]	-14.8 [-18.41 - -11.39]	-14.91 [-18.43 - -13.31]
BMI change from baseline (%)	-34.3 [-38.86 - -28.57]	-35.91 [-40 - -31.85]	-35.46 [-40.36 - -29.01]	-36.96 [-42.92 - -30.22]	-32.47 [-38.89 - -26.66]	-33.03 [-41.3 - -27.15]

Percentage of WL



Results II

Metabolic adaptation in all patients



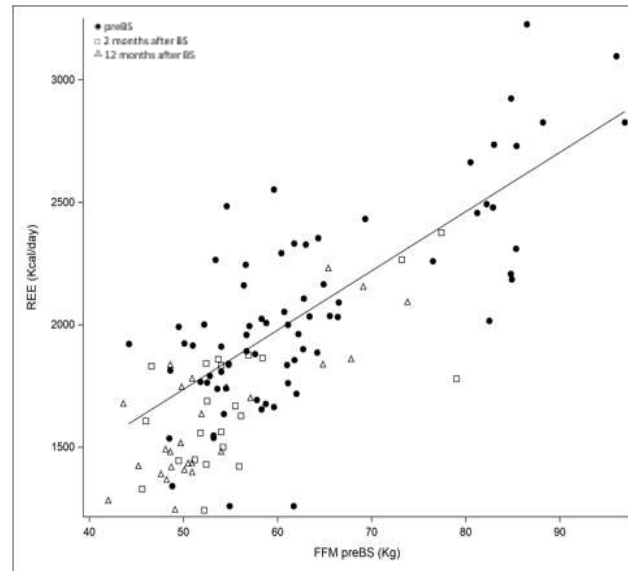
Metabolic adaptation appear at short- (2 months) and long- (12 months) term after bariatric surgery.

Results III

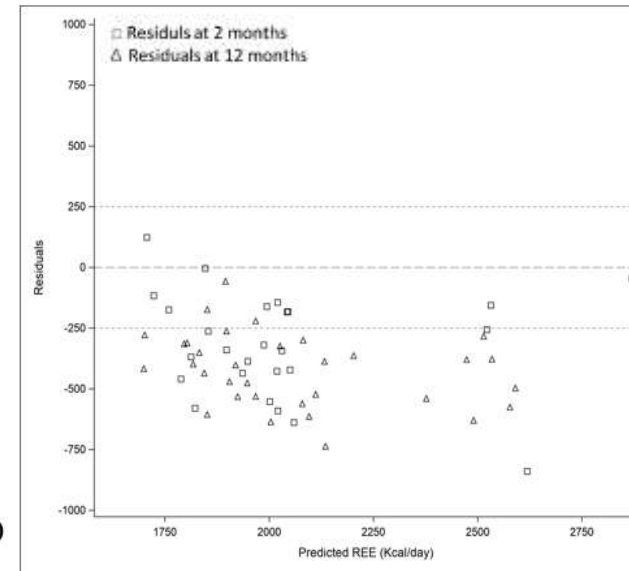
Magnitude of average metabolic adaptation after bariatric surgery procedures

- C, E: scatter plots representing REE as a function of FFM.
- Regression lines were obtained from the preBS values of REE.
- D, F: residual plots regarding the difference between observed and expected REE.

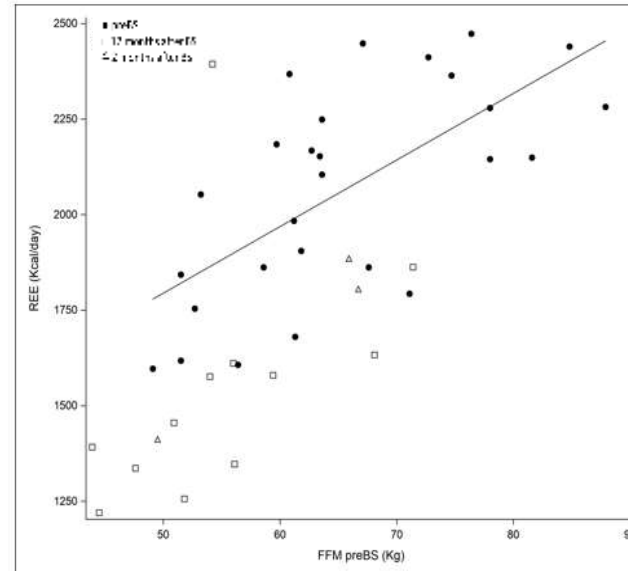
GBP patients



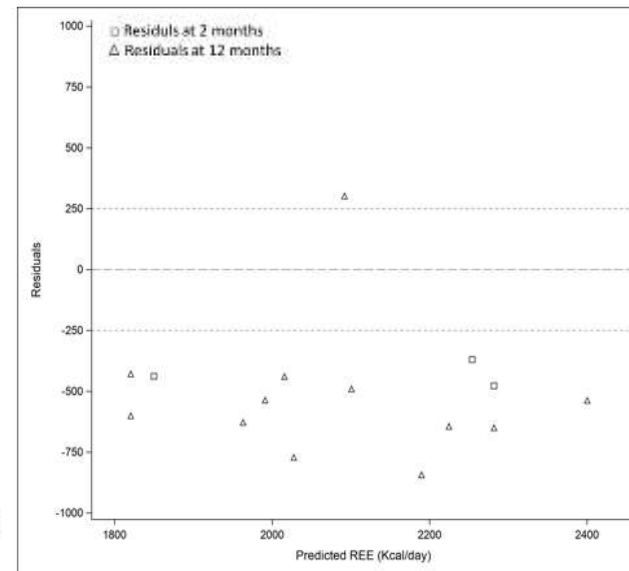
D



SG patients



F



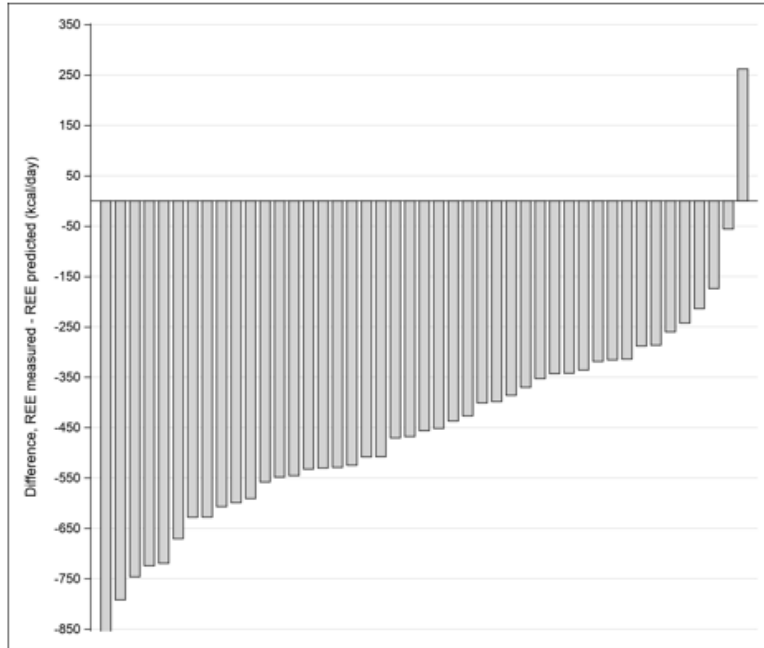
FFM: fat-free mass; REE: resting energy expenditure; preBS: pre-bariatric surgery.

Results IV

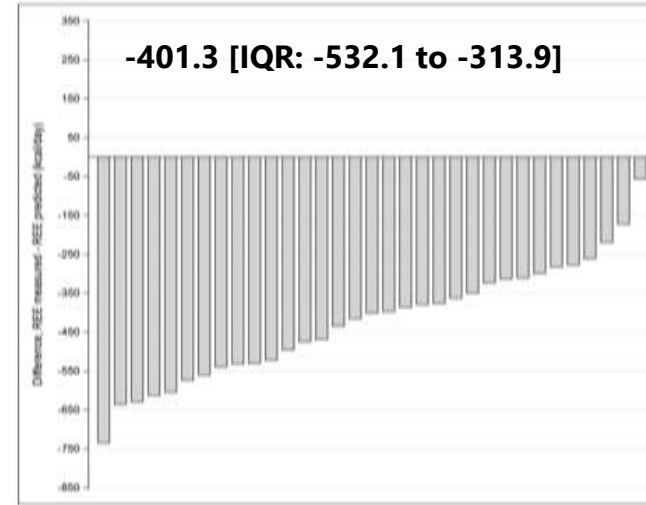
Variability range of metabolic adaptation after bariatric surgery

MA at 12 months

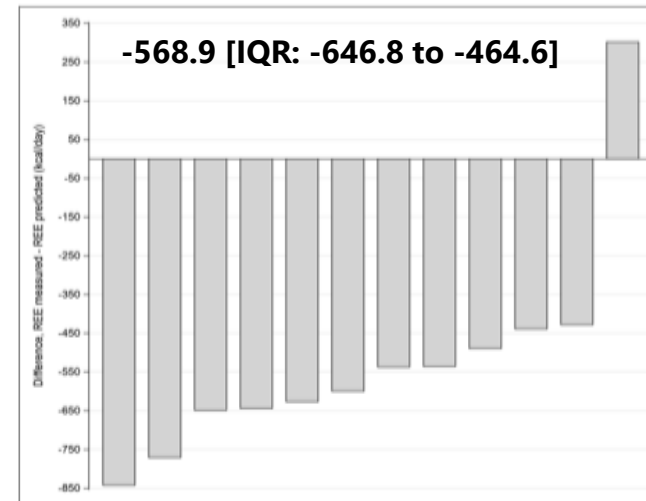
All patients



GBP



SG



P-value = 0.0123

Bar plots representing the magnitude of MA at 12 months after BS.

MA: metabolic adaptation; GBS: gastric bypass; SG: sleeve gastrectomy; BS: bariatric surgery.

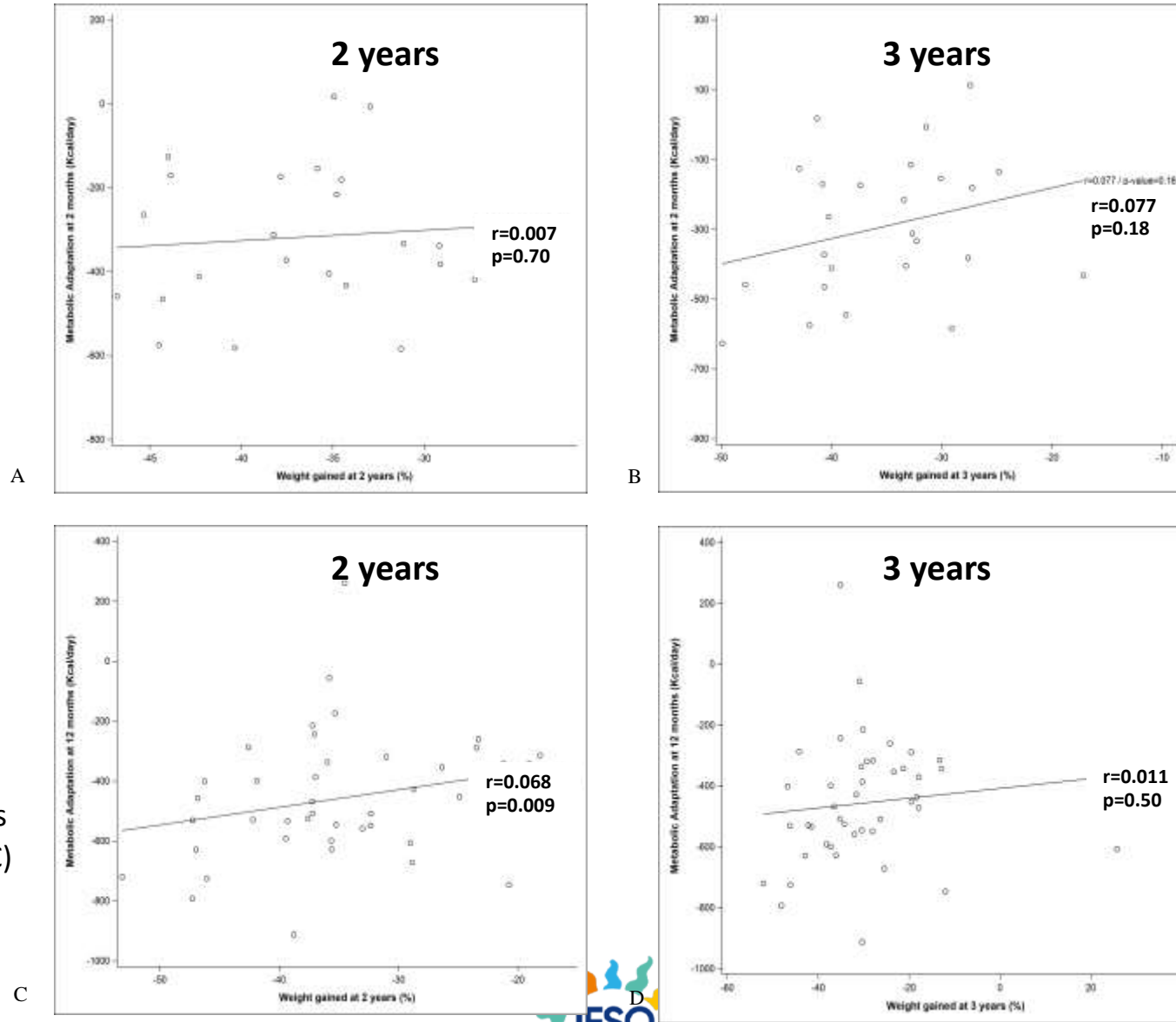
Results V

Metabolic adaptation and weight regain

Scatter plot showing the relationship between

MA at 2 months (Kcal/ day) and % of WR at 2 (Fig A) and 3 years follow up (Fig B). MA at 12 months (Kcal/ day) and % of WR at 2 (Fig C) and 3 years (Fig D) follow up.

MA and WR. MA: metabolic adaptation; WR: weight regain



Conclusions

- Our data show that patients undergoing BS experience MA during the first year after surgery.
- MA occurs in the two bariatric surgery procedures.
- MA in patients undergoing SG is significantly higher.
- However, variability in MA did not explain differences in the extent of long-term weight regain.



Aknowledgments



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Thank you for your attention!



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