

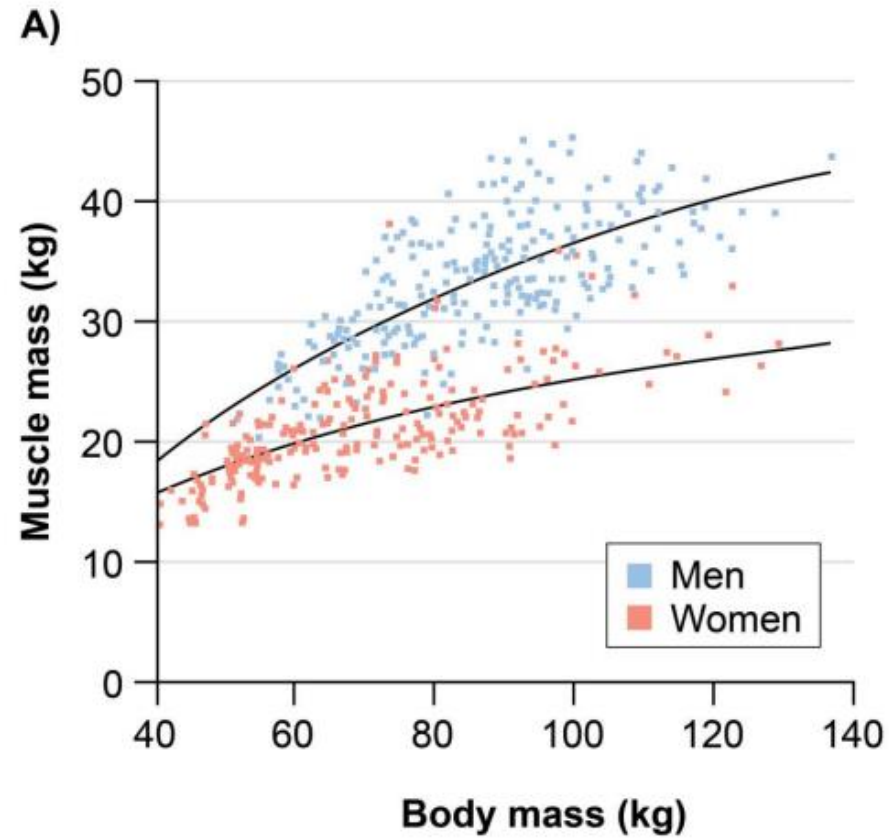
Protein malnutrition and reduction in muscle mass

Carel le Roux

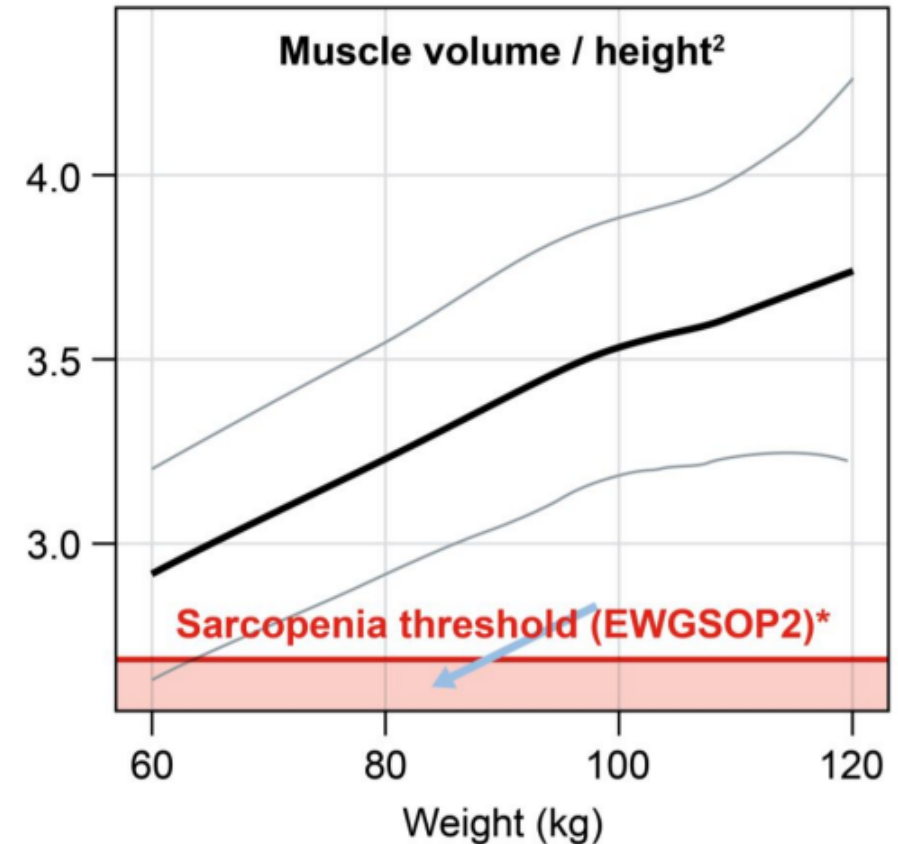
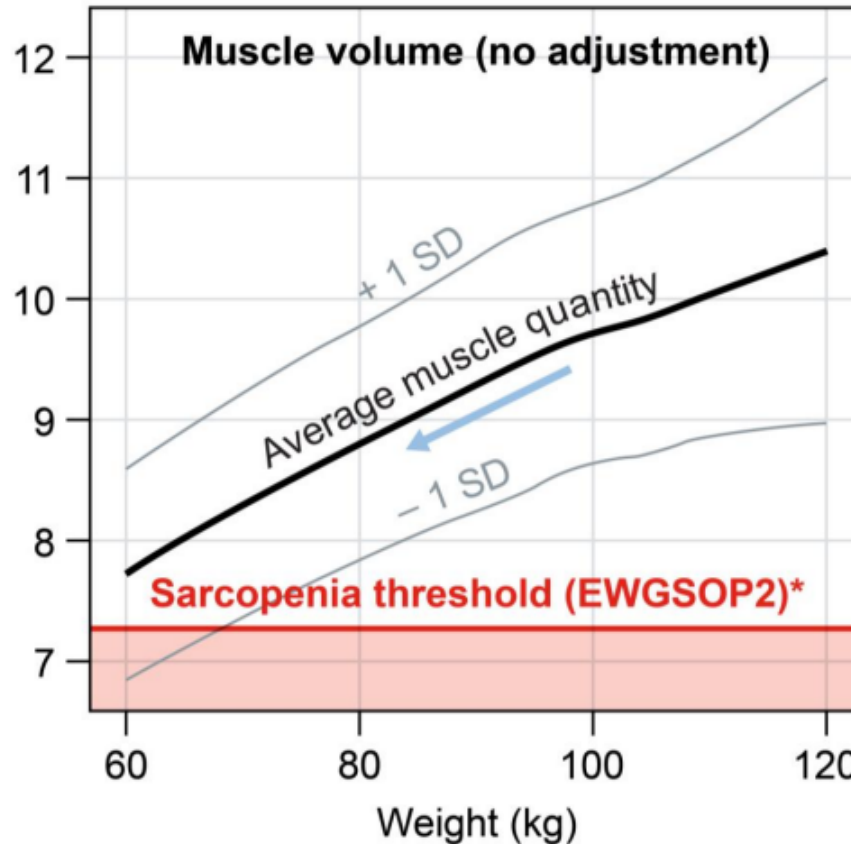
University College Dublin
Ulster University



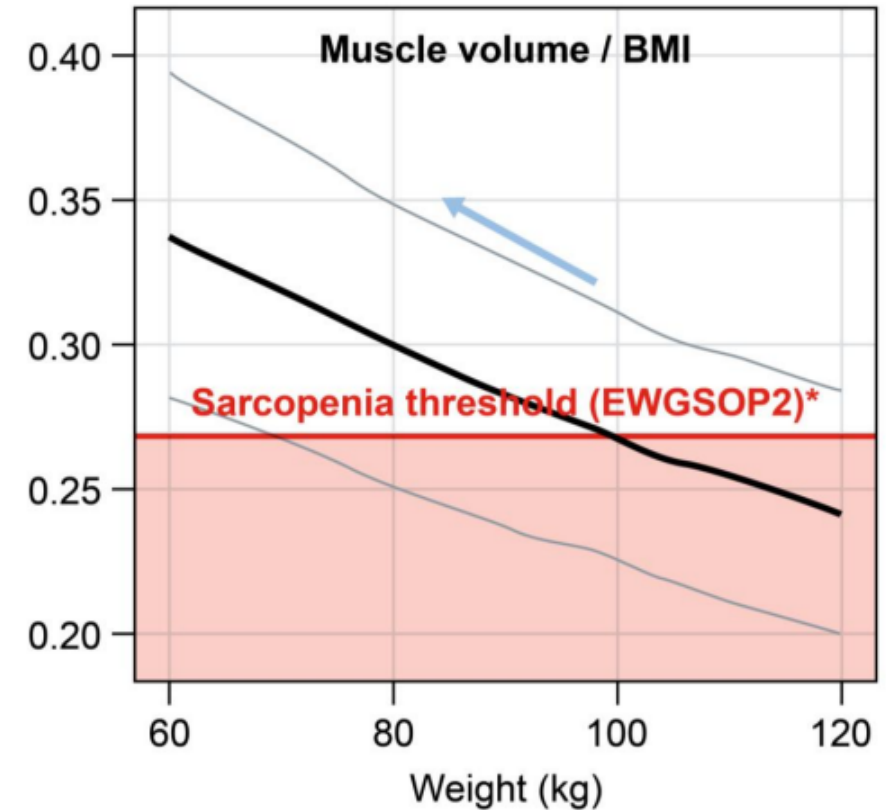
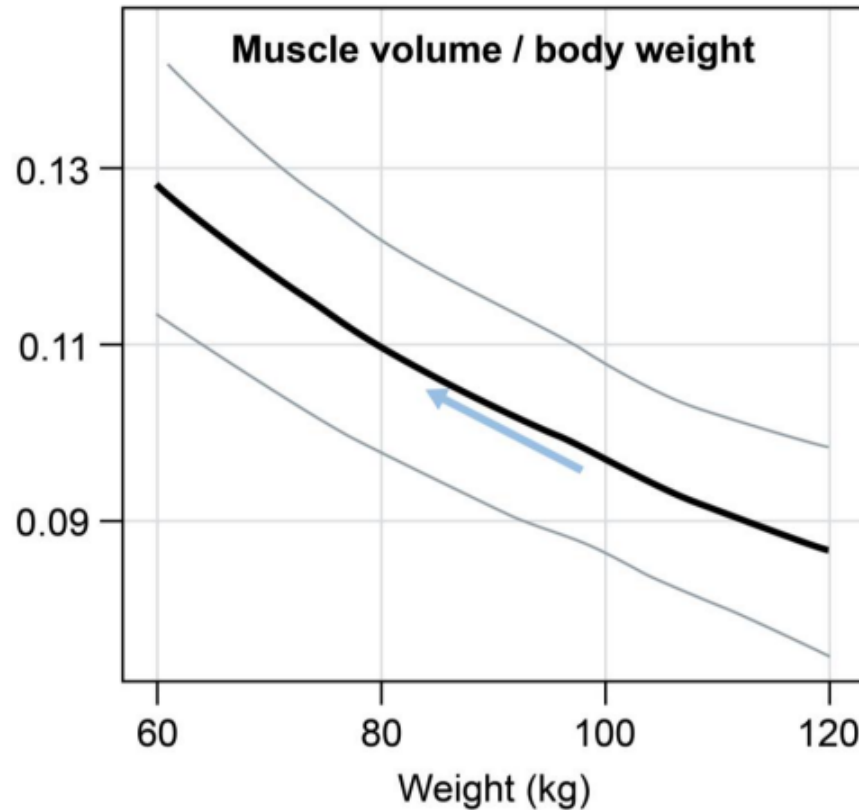
People with obesity have greater muscle mass



Interpreting changes in muscle quantity during weight loss is challenging



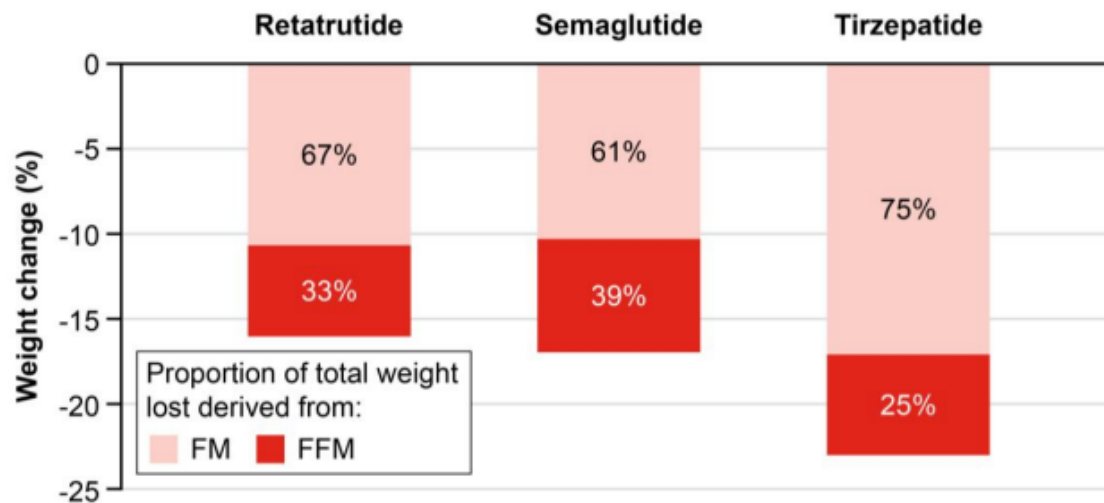
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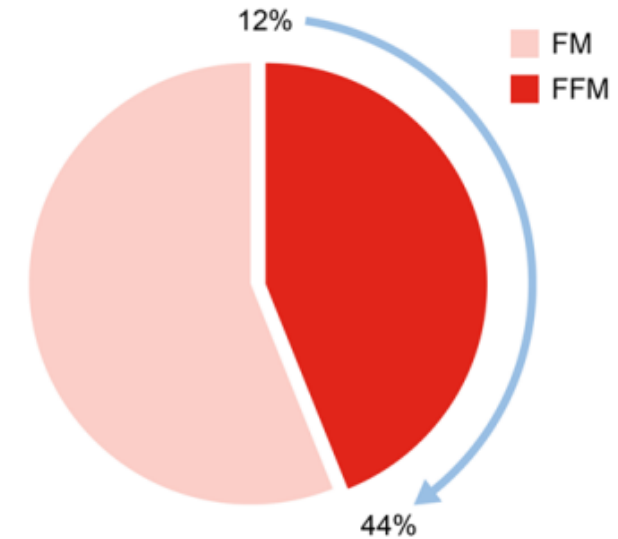
Percent weight lost as fat mass and lean body mass: OMMs vs. bariatric surgery



OMMs:
FFM ~ **25–39%** of total weight loss¹



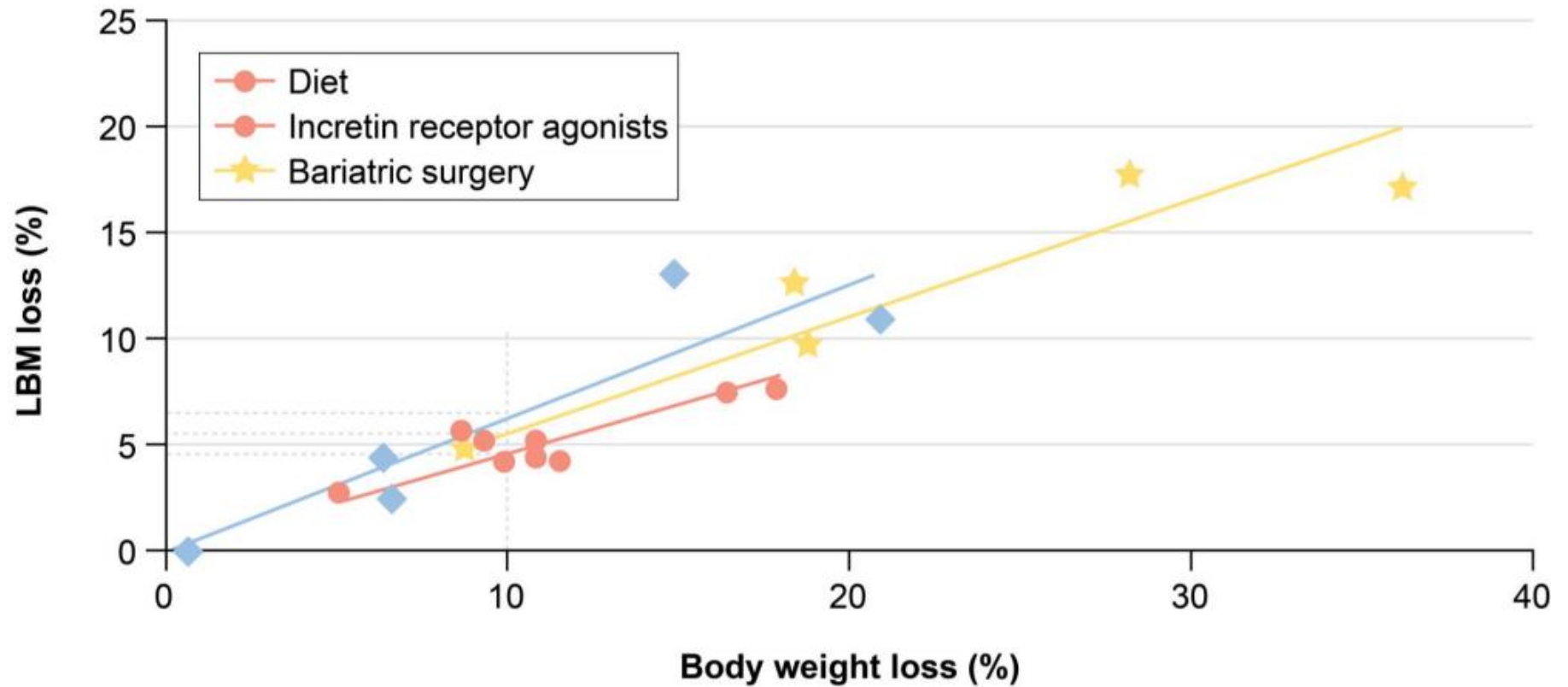
Bariatric surgery:
LBM ~ **12–44%** of total weight loss²



FM, fat mass; FFM, free fat mass; LBM, lean body mass.

1. Adapted from Conte C, et al. JAMA. 2024;332(1): 9-10. 2. Data from Sylvris A, et al. Obes Rev. 2022;23(7): e13442.

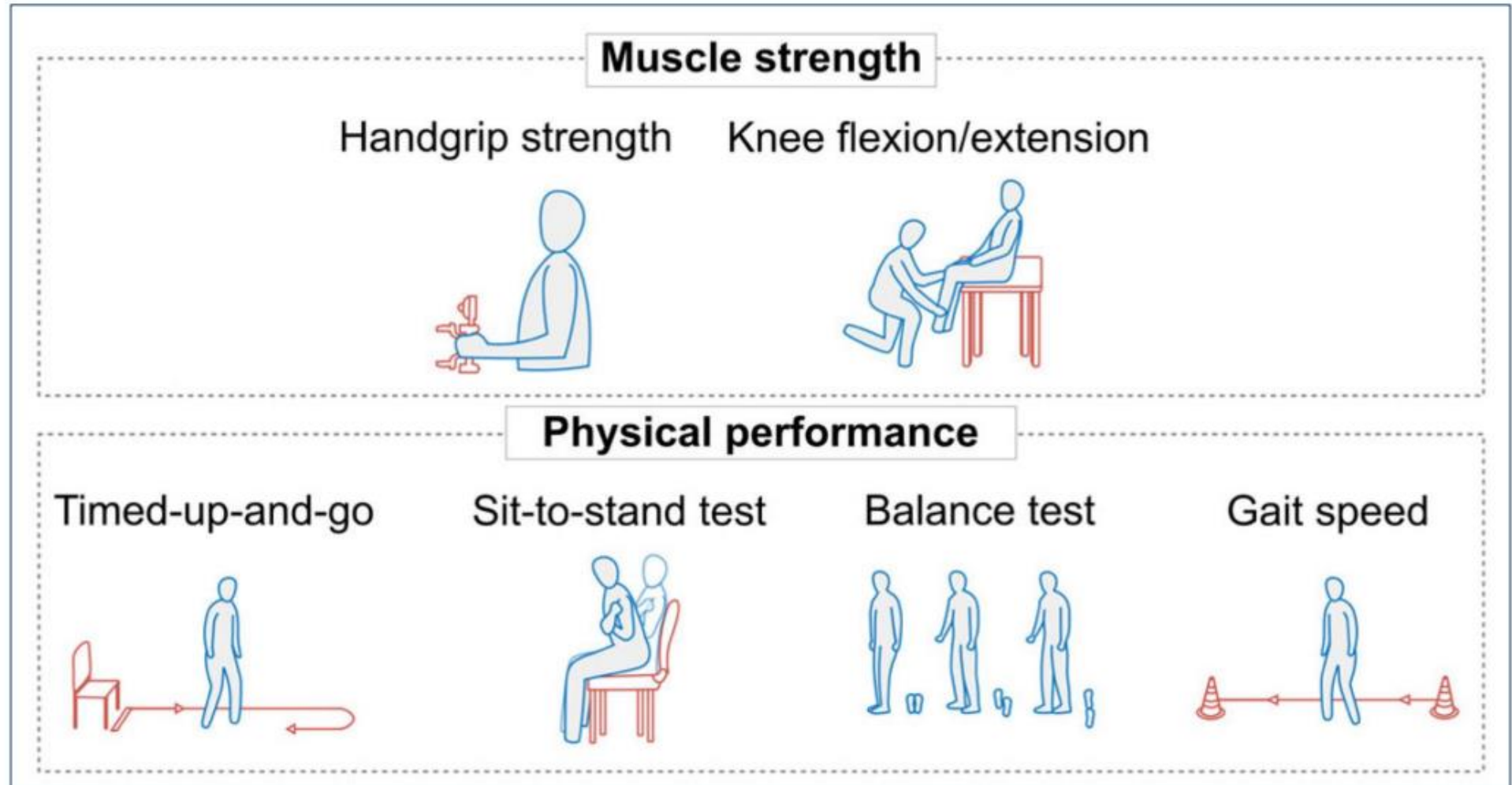
The greater the weight loss, the greater the loss of lean body mass



LBM, lean body mass.

Adapted from Linge J, et al. *Circulation*. 2024;150(16): 1288-1298.

Muscle function: how to measure

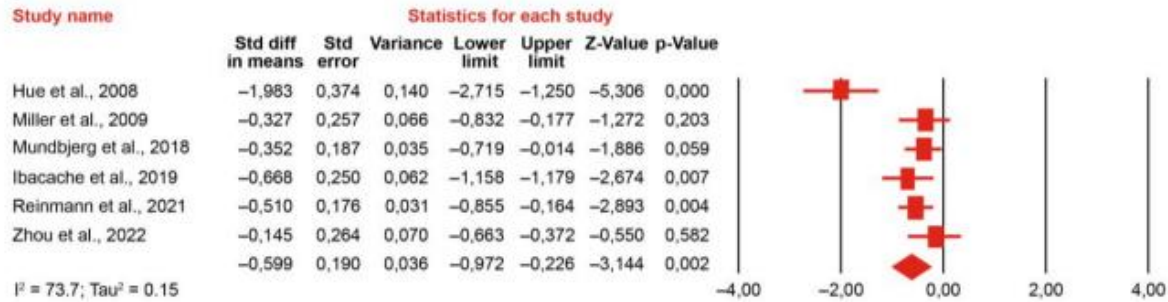


Muscle strength after bariatric surgery-induced weight loss

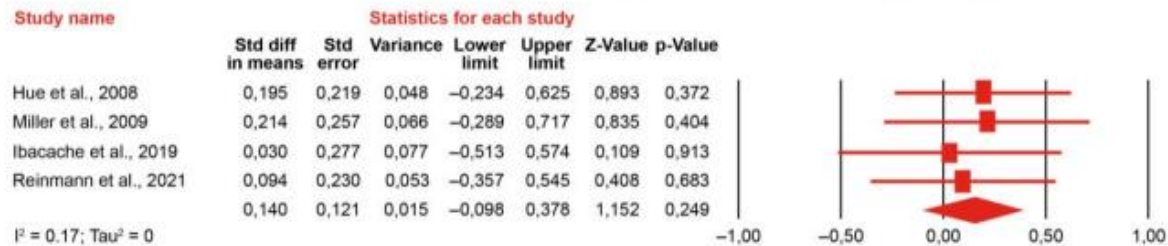


LOWER LIMB STRENGTH

B) ↓ Absolute lower limb strength

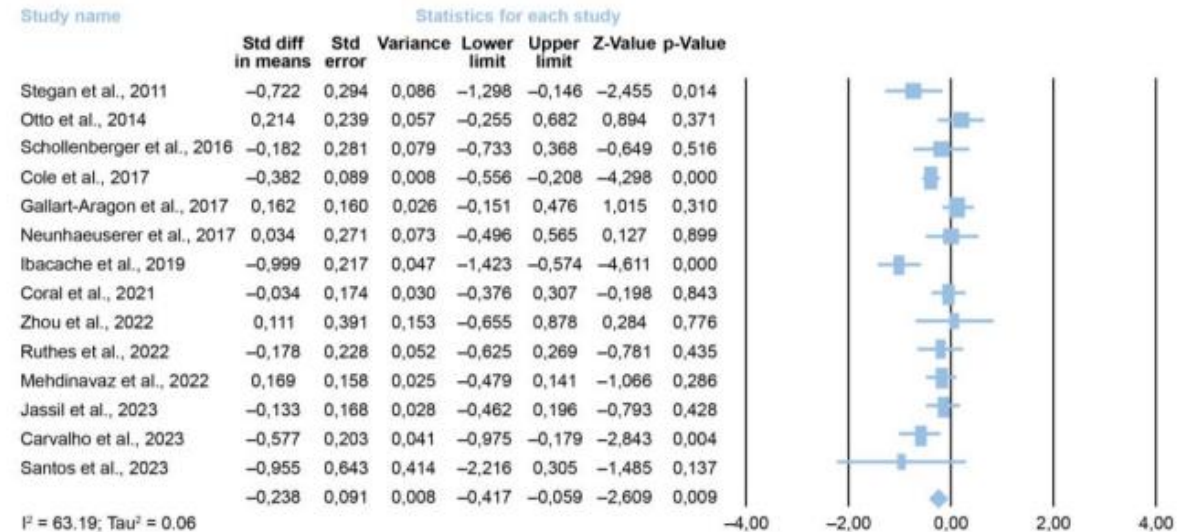


C) ↔ Lower limb strength relative to body weight

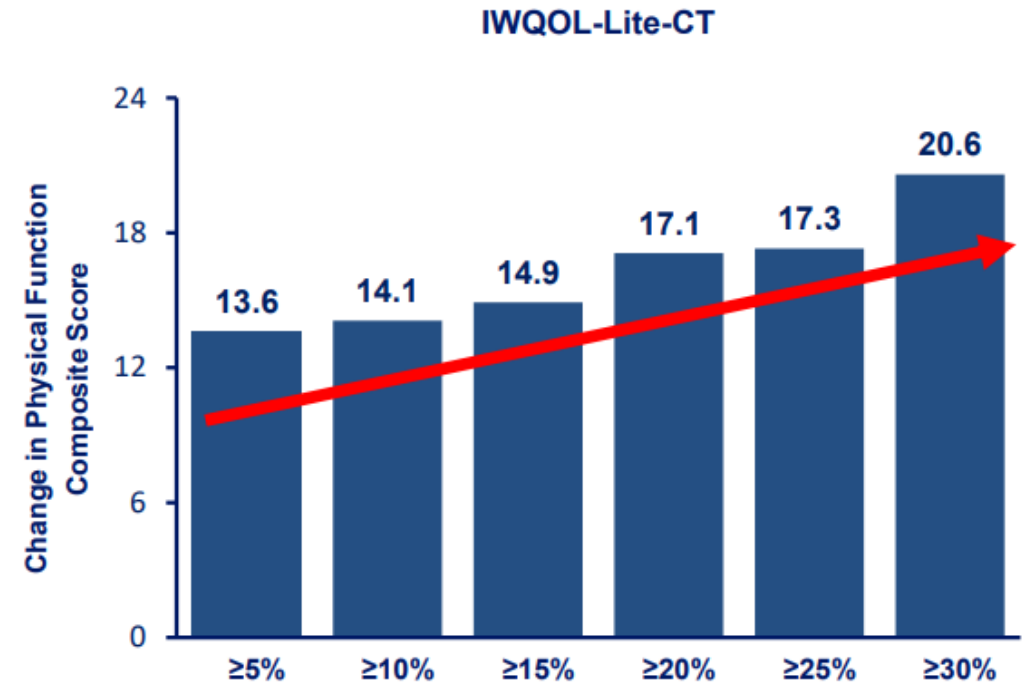
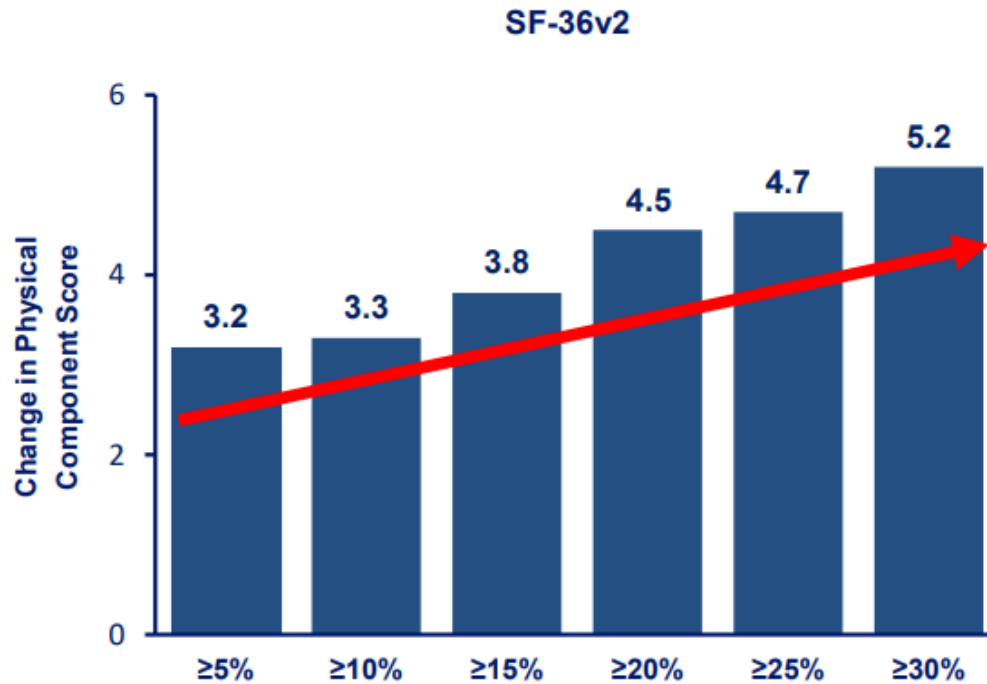


↔ HANDGRIP STRENGTH

A) Absolute handgrip strength



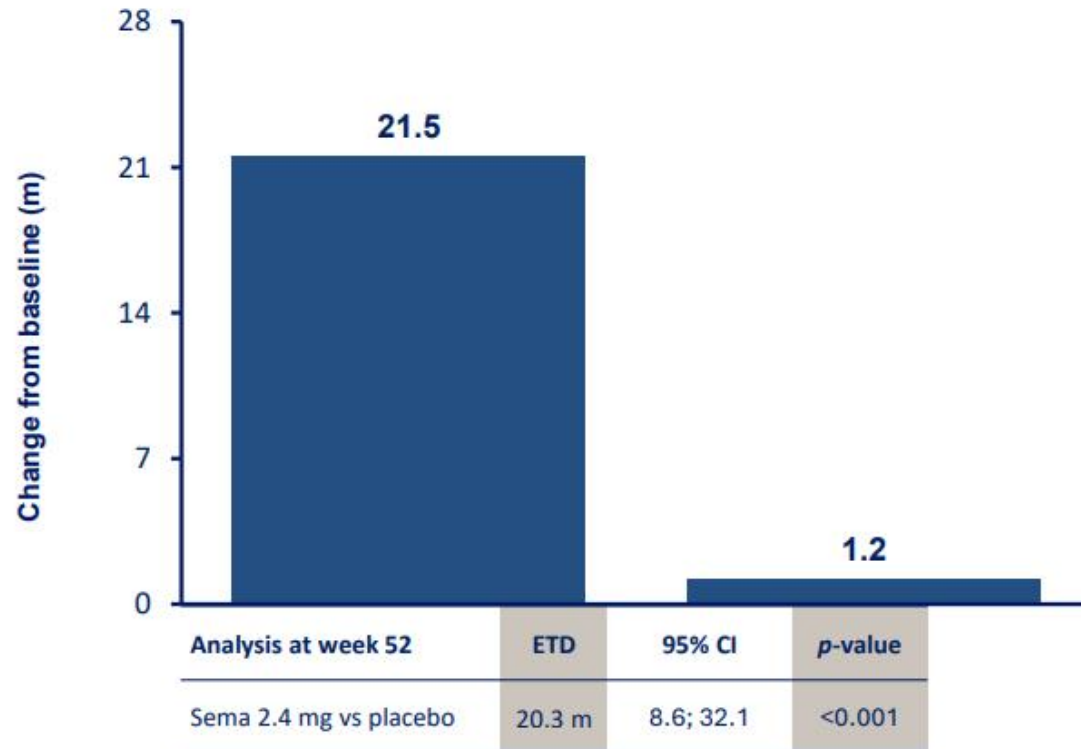
The greater the TZP-induced weight loss, the greater the improvement in physical function



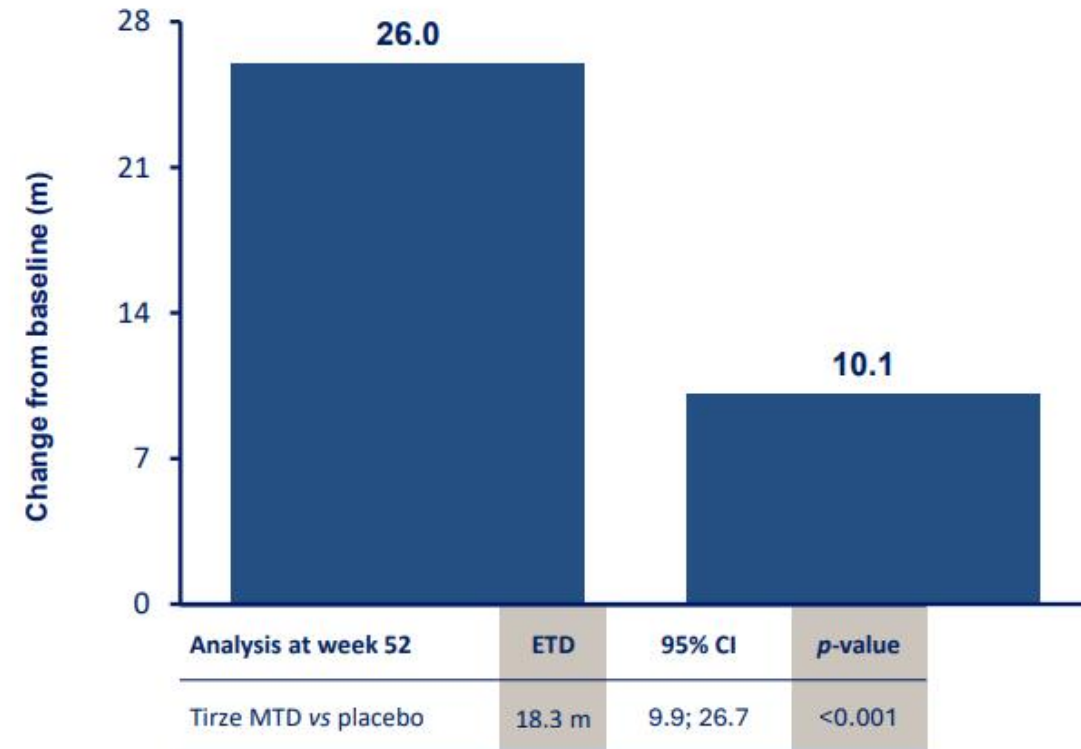
Incretin-based OMMs improve physical function (6MWT) in people with obesity and HFpEF



Semaglutide¹

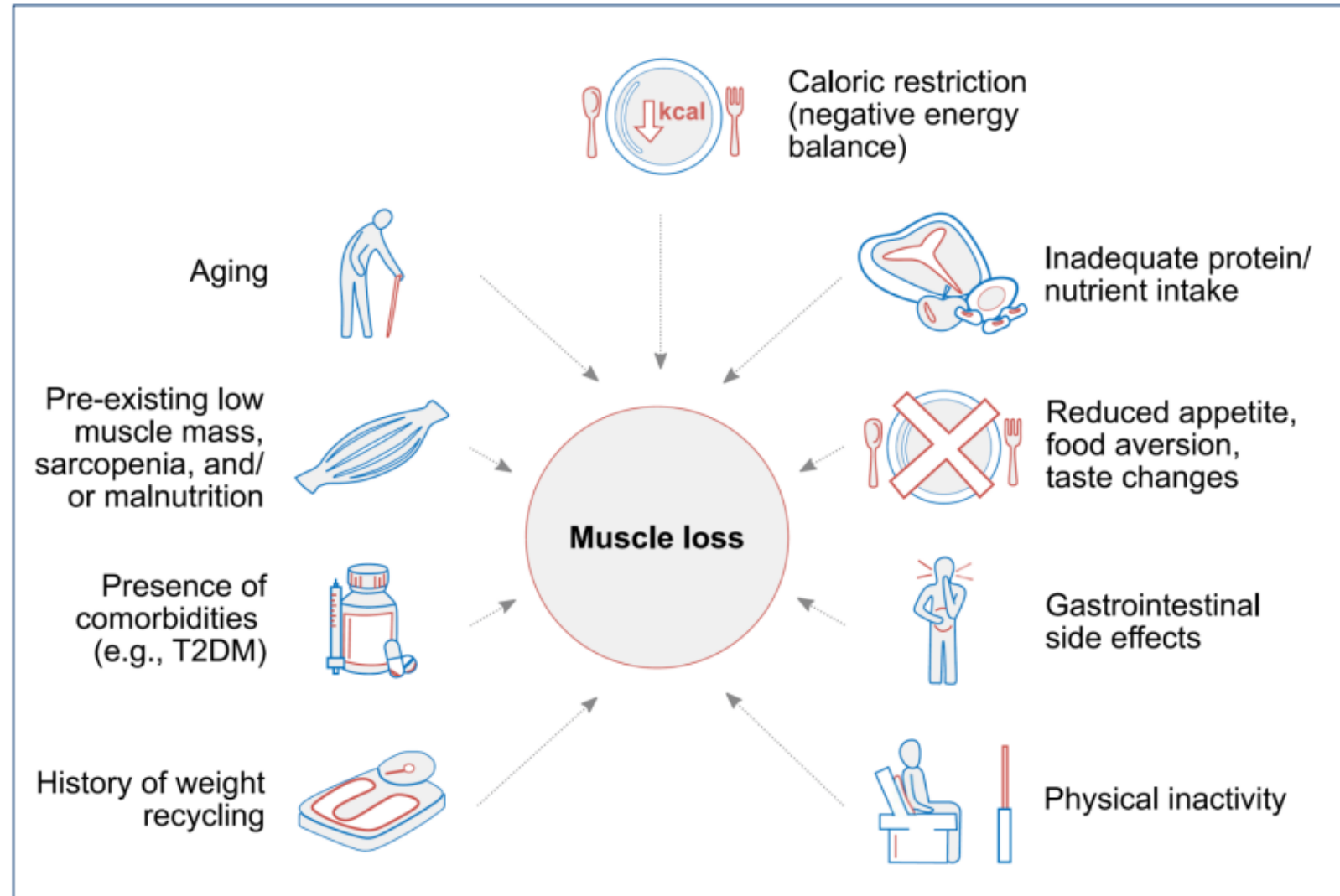


Tirzepatide²

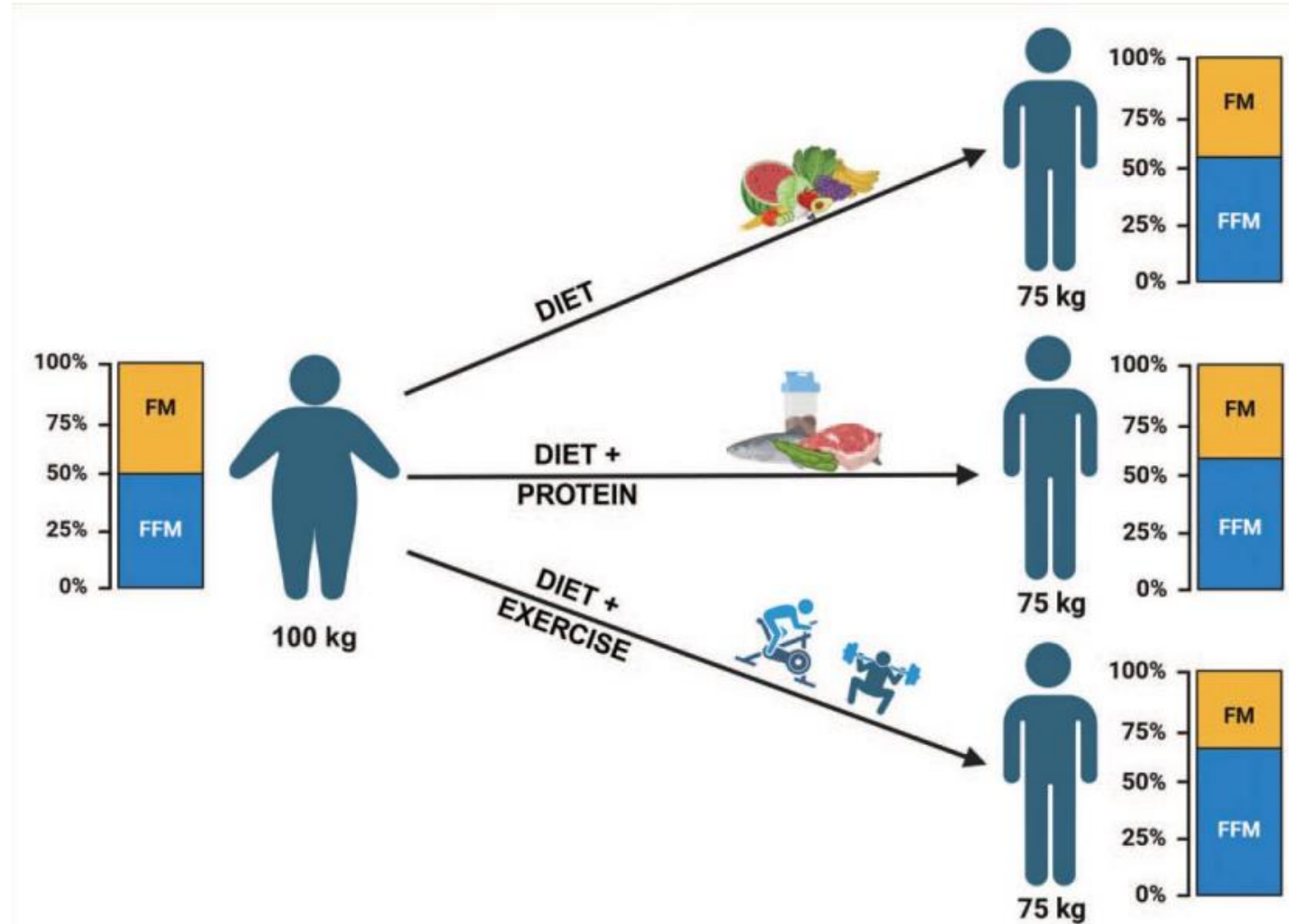


6MWT, 6-minute walk test; CI, confidence interval; ETD, estimated treatment difference; HFpEF, heart failure with preserved ejection fraction; OMM, obesity management medication; Sema, semaglutide. Data from 1. Kosiborod MN, et al. N Engl J Med. 2023;389(12): 1069-1084; 2. Packer M, et al. N Engl J Med. 2025;392(5): 427-437.

Know the factors associated with muscle loss



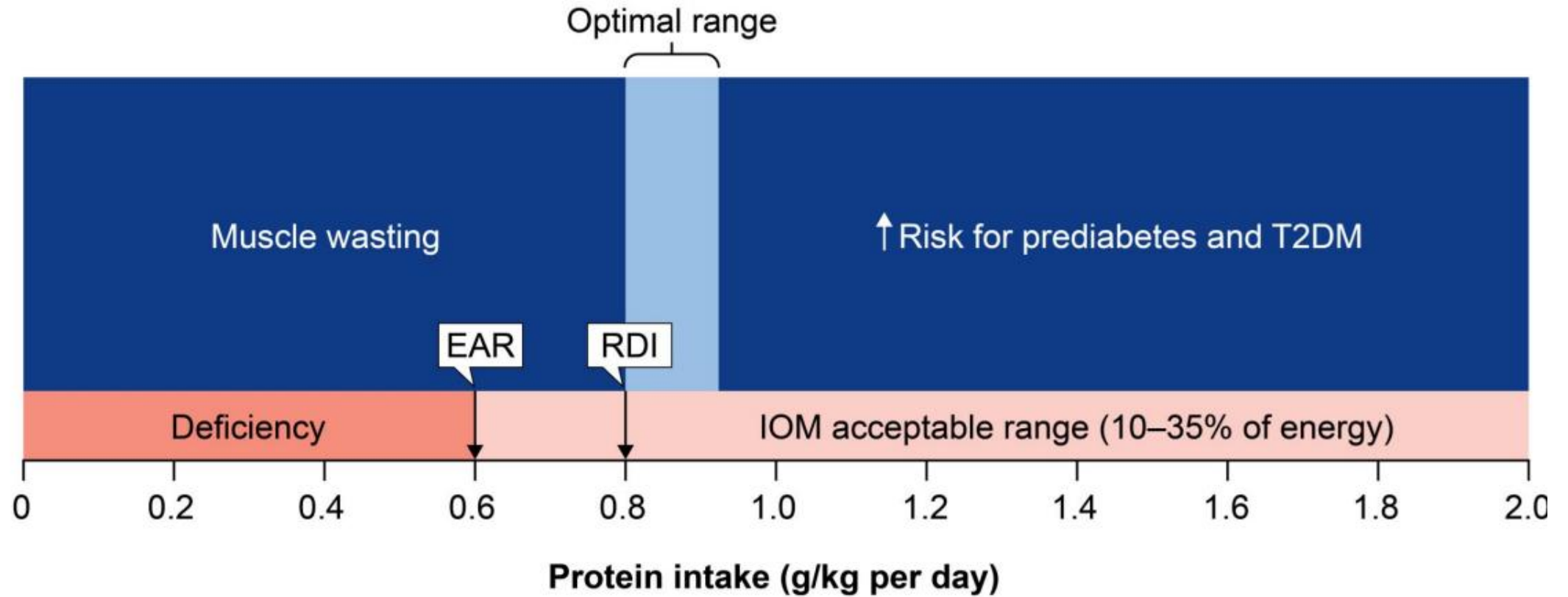
Diet & exercise can improve weight loss composition



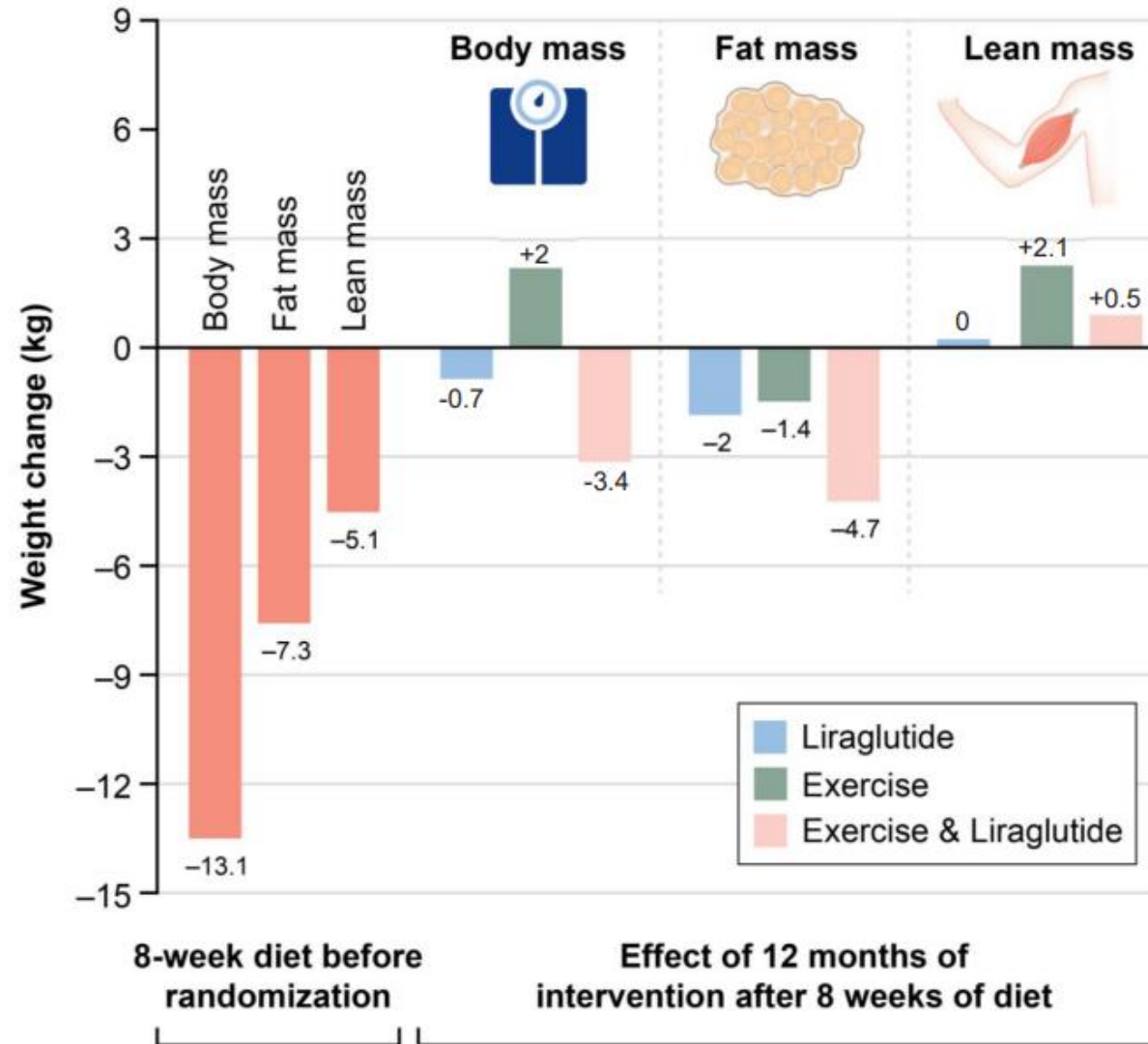
FM, fat mass; FFM, free fat mass.

Caturano A, et al *Curr Opin Clin Nutr Metab Care*. 2025;28(4): 339-350.

Virtue lies in the middle



Exercise training preserves lean mass in people on incretin therapy

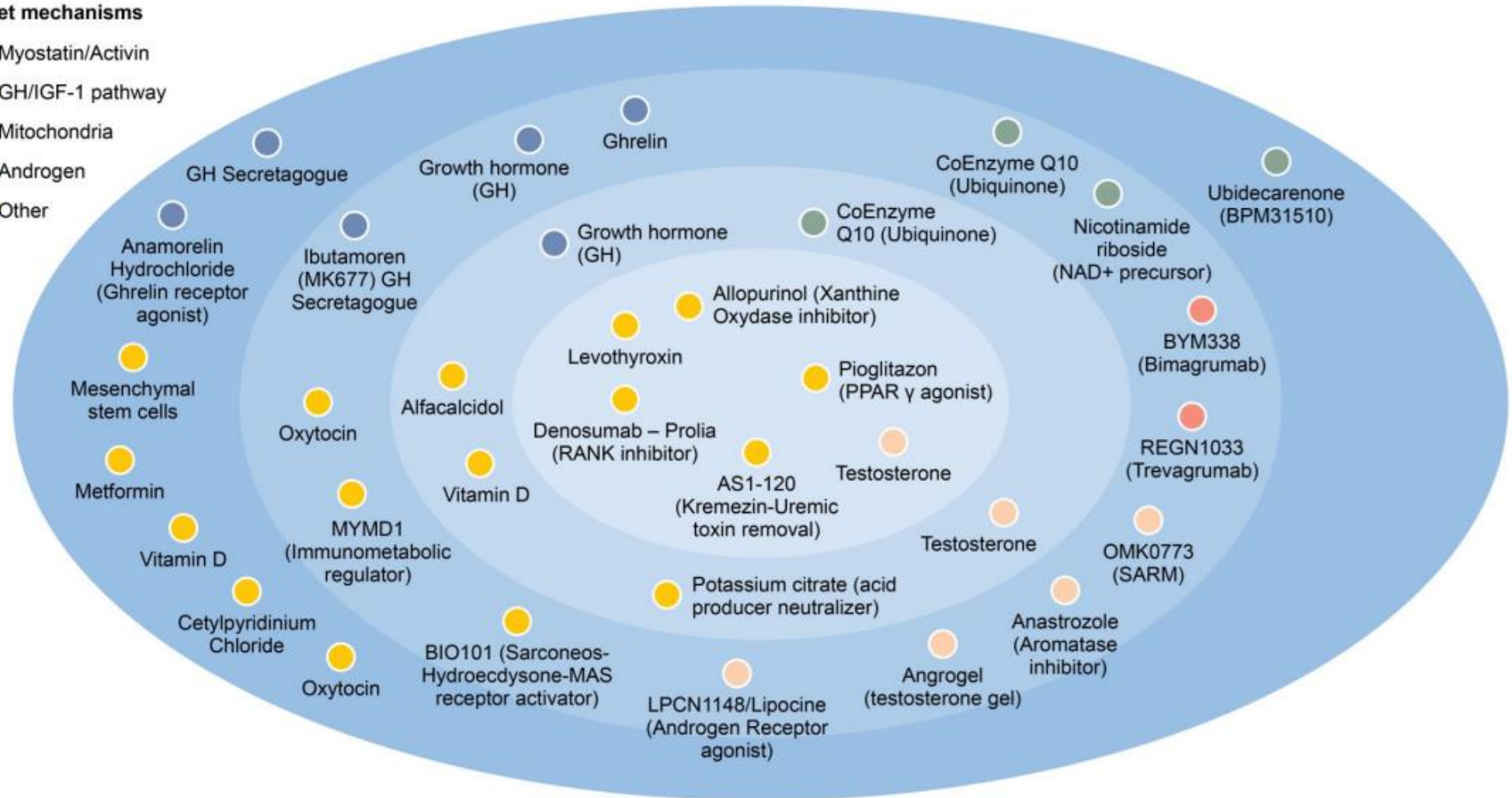


Several medications are under investigation for muscle mass preservation



Target mechanisms

- Myostatin/Activin
- GH/IGF-1 pathway
- Mitochondria
- Androgen
- Other



Strategies to preserve skeletal muscle



+



- Adequate dietary protein
- Exercise (resistance >> aerobic)
- New medications?

Is weight loss-induced muscle mass loss clinically relevant?



- **Sarcopenia and frailty as a consequence of weight loss are unlikely in most people**
- **Some populations** (e.g., older adults, individuals with severe obesity, and other conditions at risk for sarcopenic obesity) **may be at risk**
- **Adequate nutrition and resistance exercise**, combined with obesity management medications or bariatric metabolic surgery, **help optimize body composition during weight loss**