

The Role of Physical Activity and Exercise in Obesity Treatment

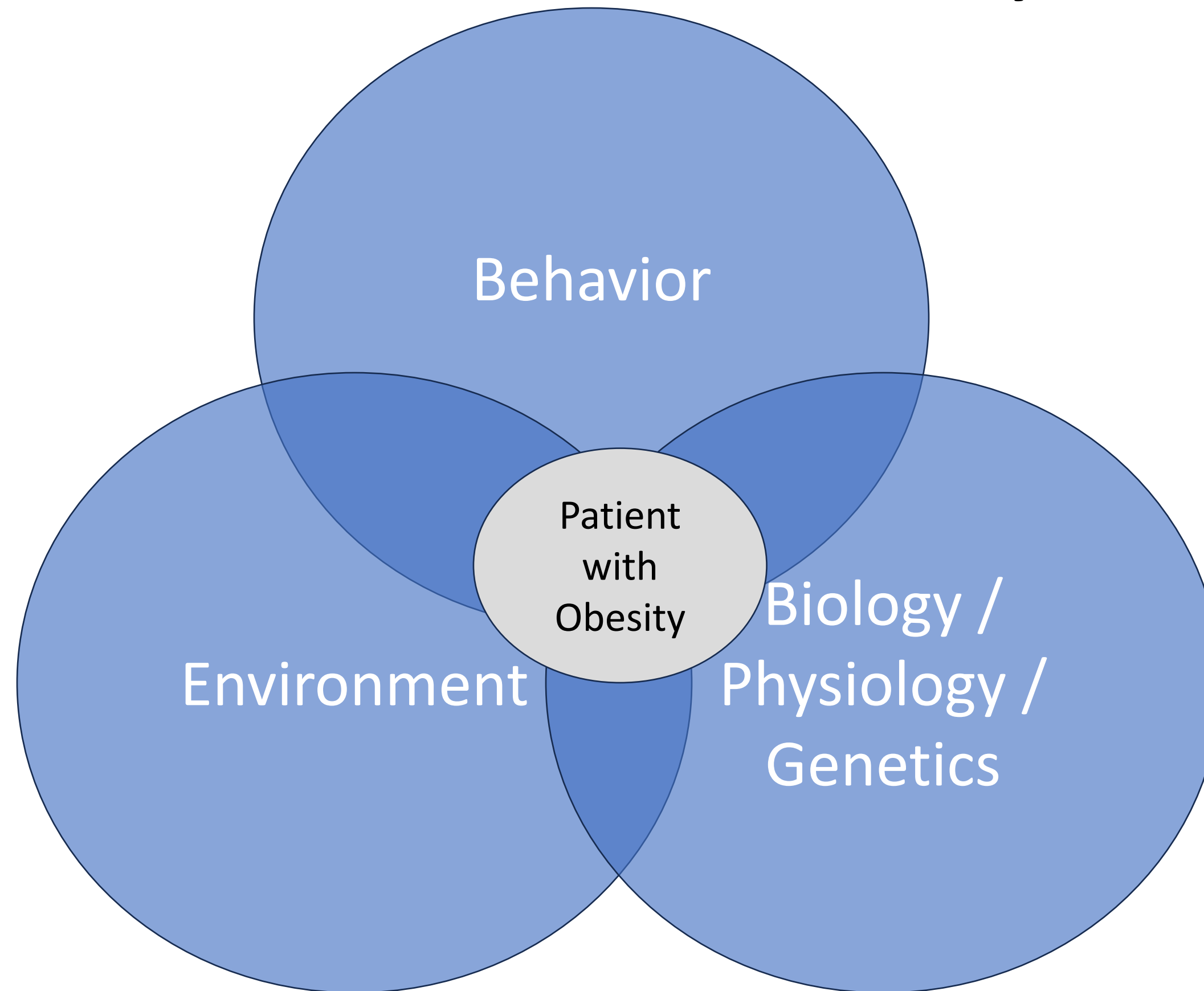
John M. Jakicic, PhD,
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Division of Physical Activity and Weight Management

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Disclosure

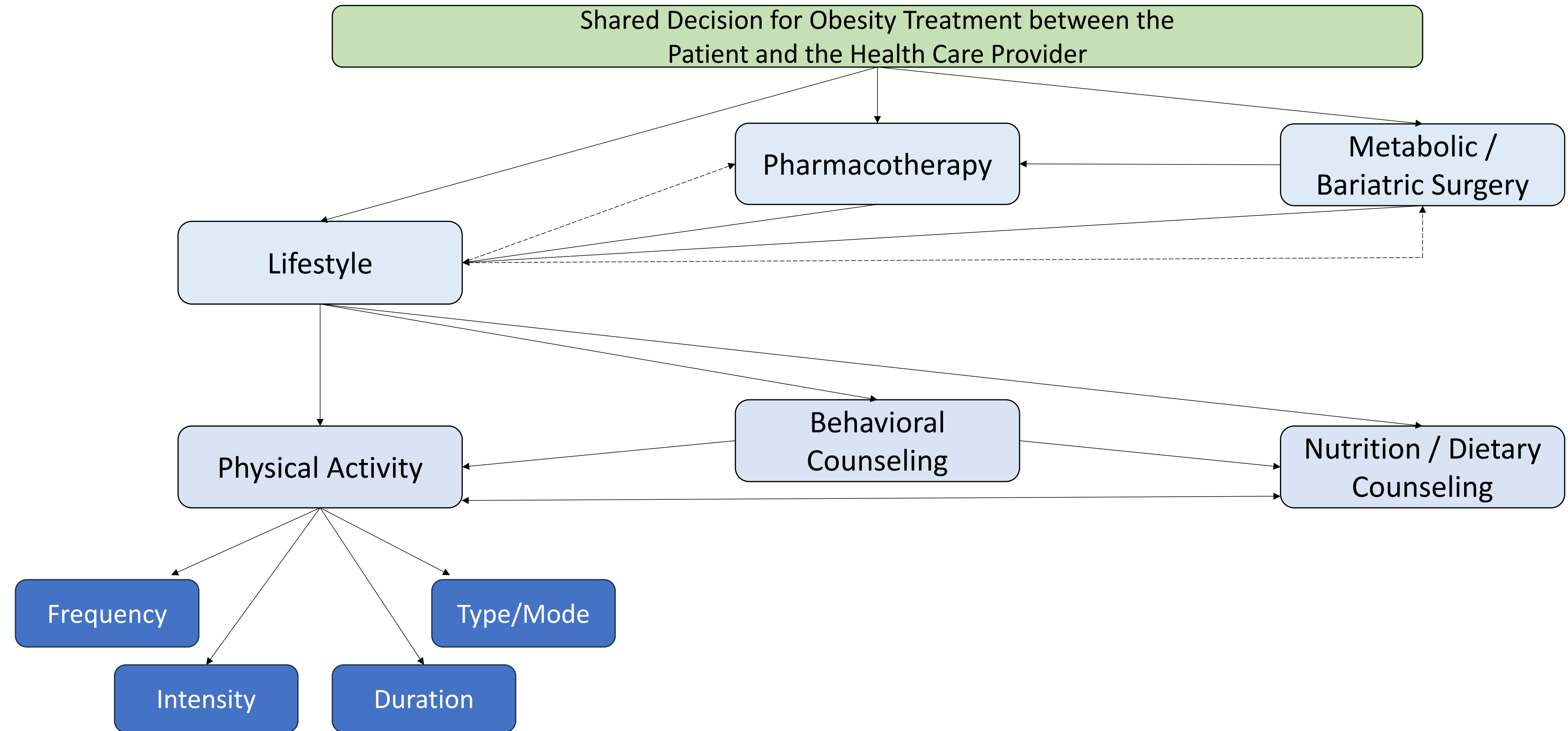
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Causes / Contributors to Obesity



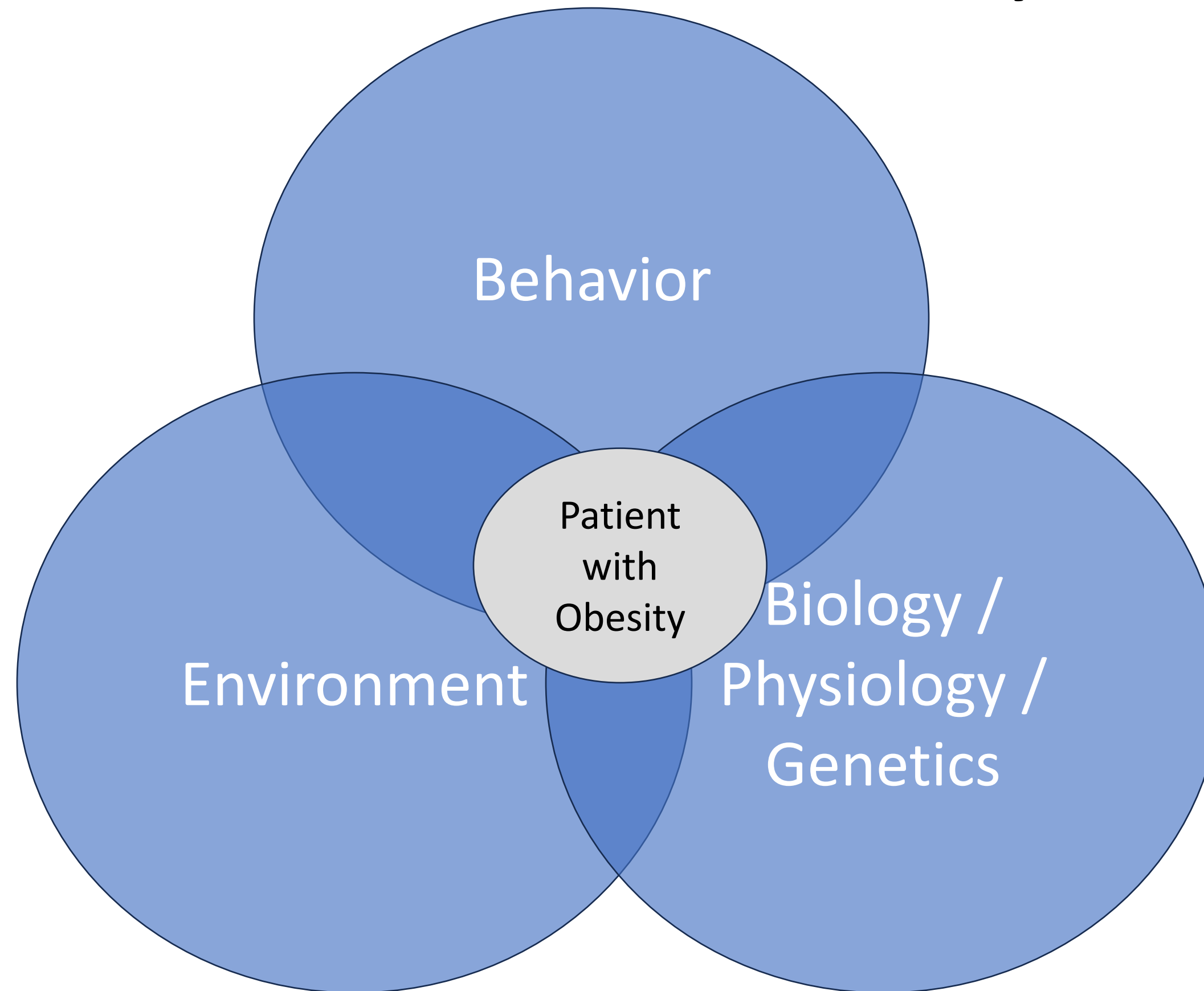
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Framework for inclusion of lifestyle factors, including physical activity, within obesity treatment.

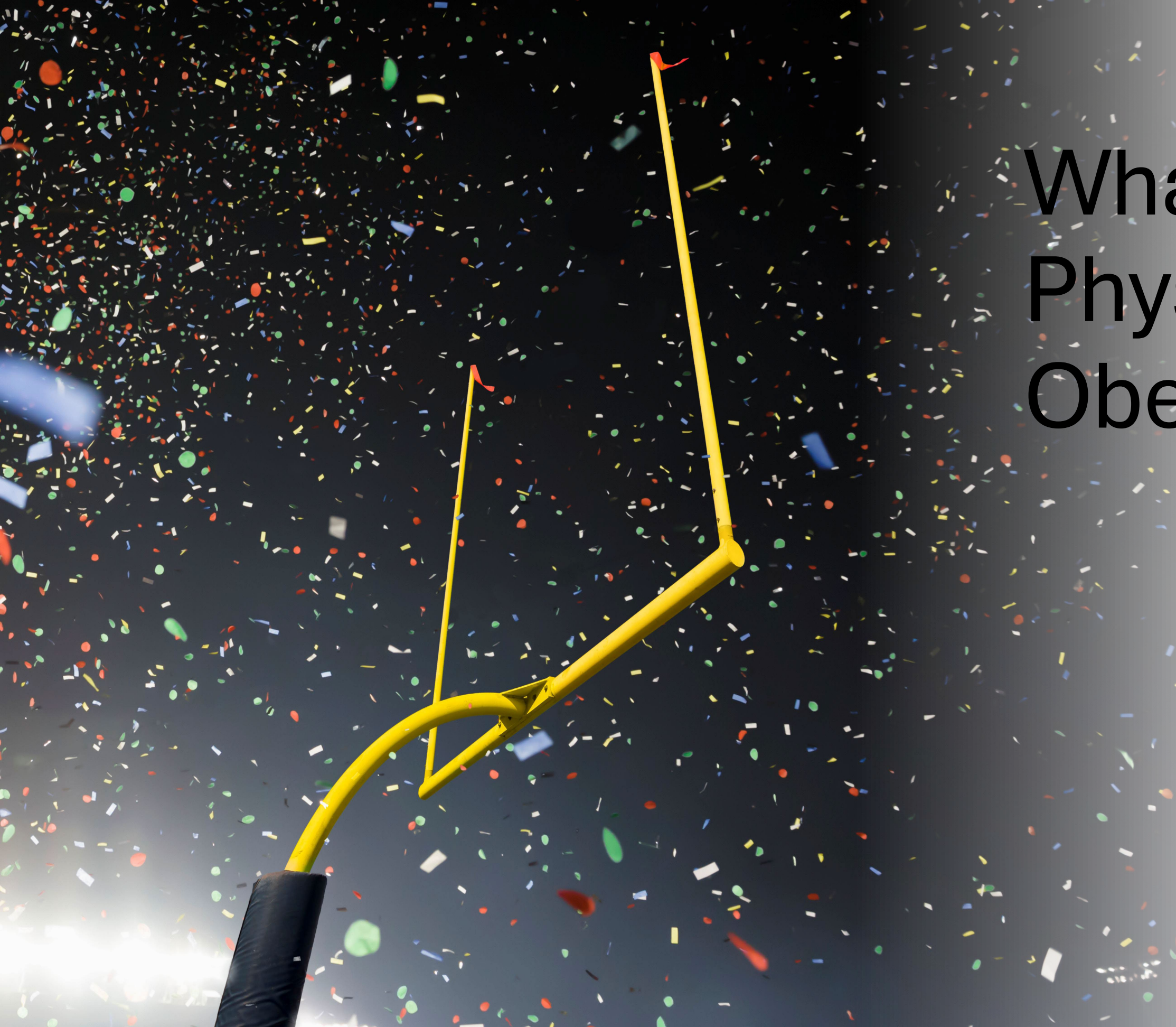


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Causes / Contributors to Obesity



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What is the Goal of Physical Activity in Obesity Treatment?

Weight Loss?

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Prevention of Weight Gain and Obesity

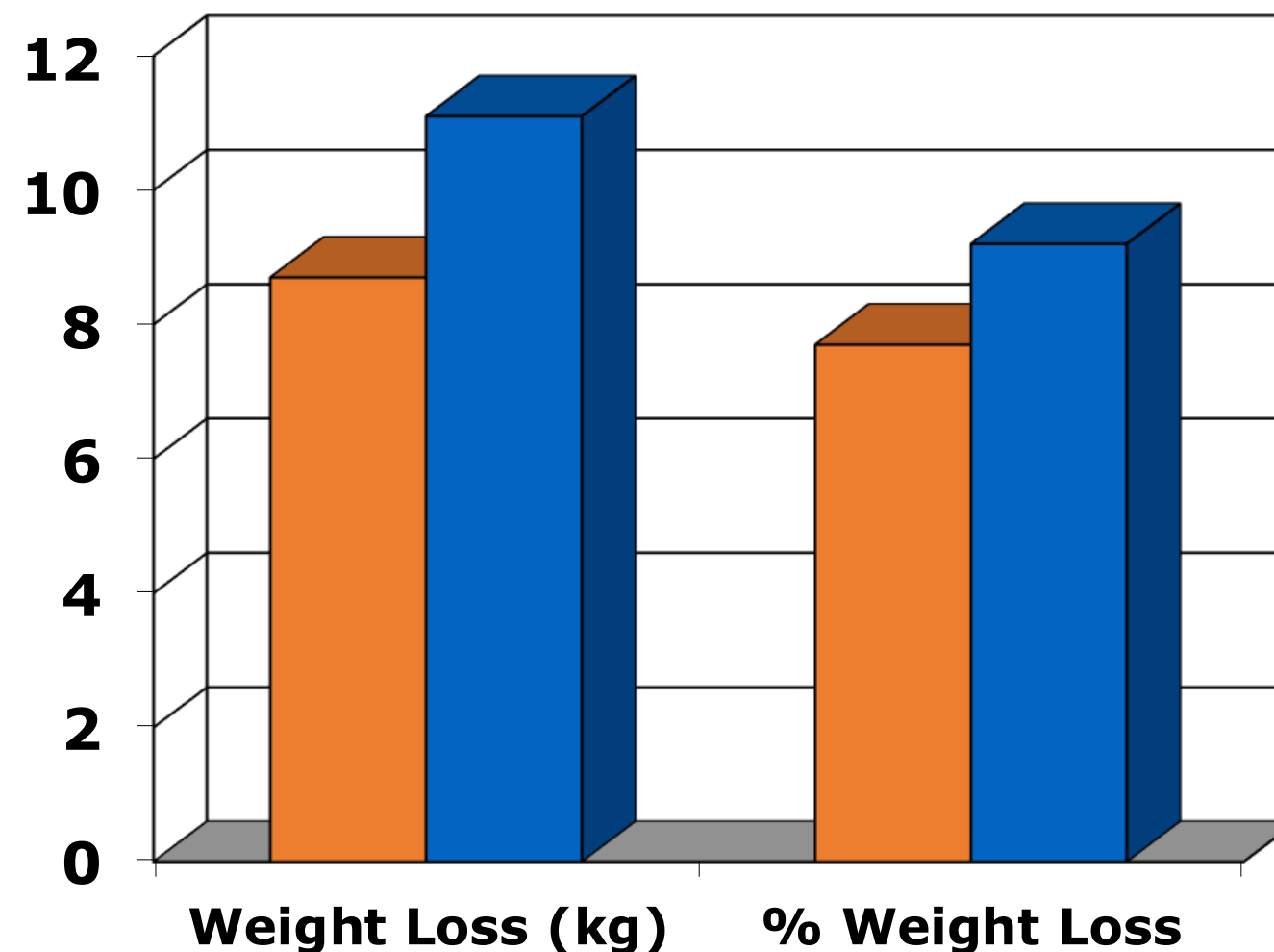
- Physical activity is a key lifestyle behavior for the prevention of weight gain. (Jakicic et al. Med Sci Sports Exerc. 2001; Donnelly et al. Med Sci Sports Exerc. 2009; Jakicic et al. Med Sci Sports Exerc. 2024)
- There is an association between greater amounts of physical activity and attenuated weight gain in adults.
 - This may be most pronounced when physical activity exposure is at a moderate-to-vigorous intensity and is above 150 min·wk⁻¹.
(Jakicic et al. Med Sci Sports Exerc. 2019)
- Physical activity is associated with reduced risk of development of obesity. (Jakicic et al. Med Sci Sports Exerc. 2019)
- Physical activity is associated with increase odds of maintaining a healthy body weight. (Jakicic et al. Med Sci Sports Exerc. 2019)

Weight Loss

- Physical Activity Alone
 - Physical activity without a concurrent energy-restricted diet generally provides modest weight loss of approximately 0.5 to 3.0 kg
 - Greater weight loss and reductions in adiposity occur in a dose-response manner in response to physical activity.
 - Selective forms of physical activity may result in reduction in visceral adiposity and a possible increase in muscle mass.
 - Evidence is based on aerobic and resistance exercise.

Weight Loss

- Physical Activity Combined with Restriction in Energy Intake
 - Physical activity is additive the effect of diet
 - May increase weight loss by ~20% compared to what is observed with an energy-restricted diet alone
 - The effect may be enhanced as dose of physical activity is increased.



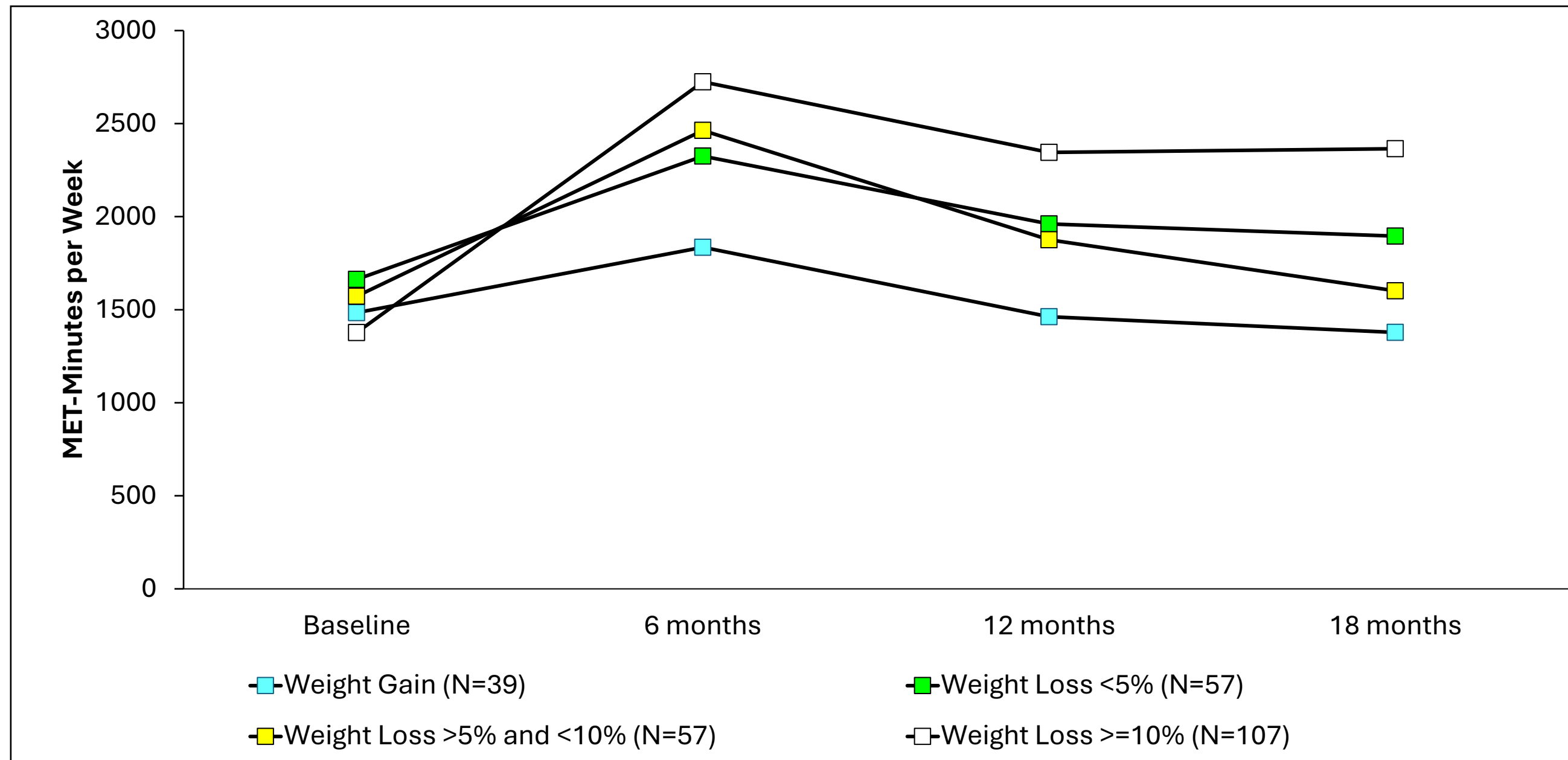
2.4 kg (22%) difference in weight loss between groups

■ Diet
■ Diet + Exercise

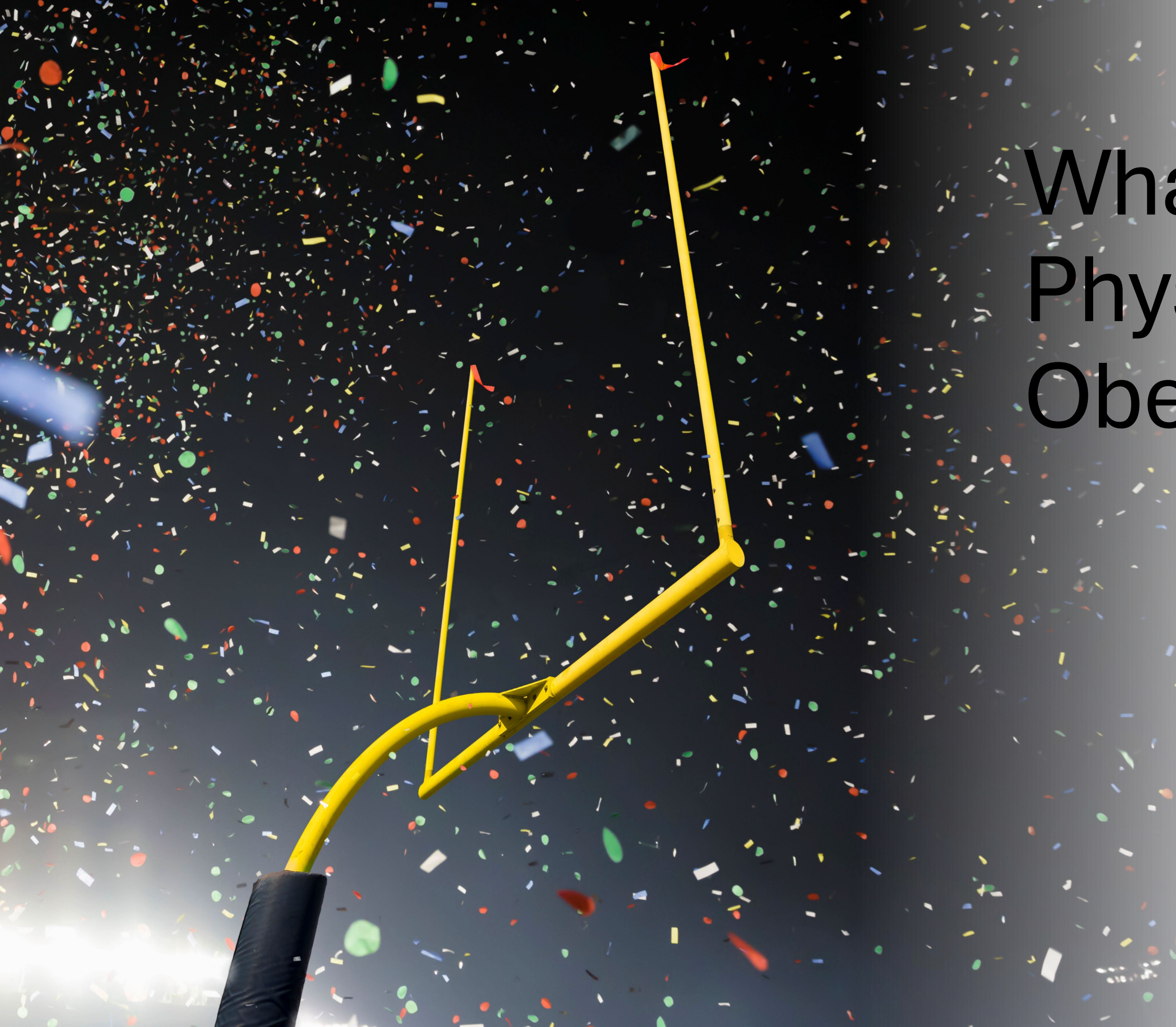
Goodpaster et al. JAMA 2010

Long-Term Weight Loss

- Physical Activity is associated with enhanced long-term weight loss and weight loss maintenance.
 - 200 to 300 min·wk⁻¹ or ≥ 2000 kcal·wk⁻¹ of leisure-time physical activity (Donnelly et al. Med Sci Sports Exerc. 2009)



Jakicic et al. *Obesity*. 2014; 22: 2284-2292.



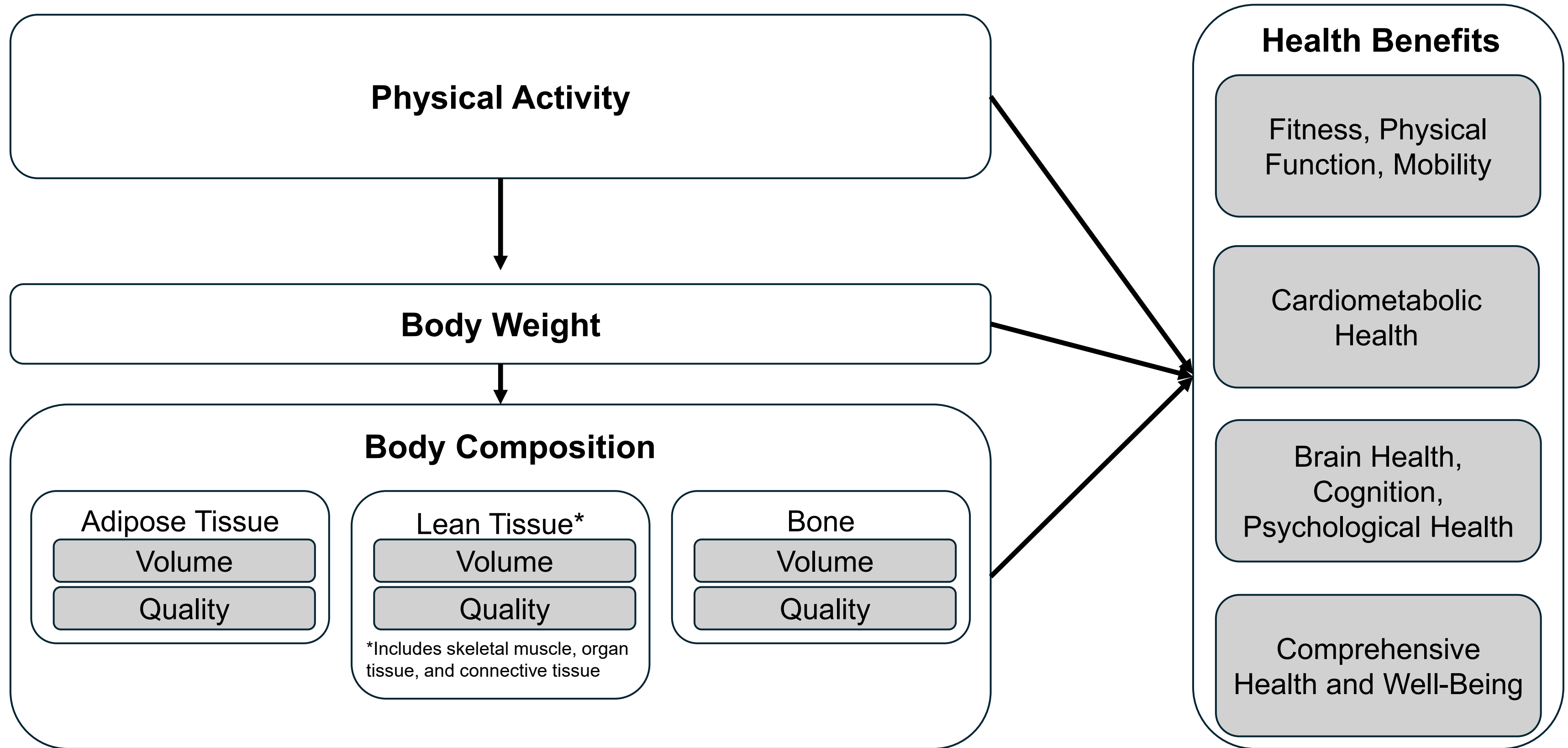
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Weight Loss?

Obesity Treatment!

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Goals of Physical Activity in Obesity Treatment



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Adapted from Jakicic et al. Physical Activity and Exercise within the Context of Obesity Treatment: Enhancing Health Beyond Weight Loss. In Review: Journal of Sport and Health Sciences

Weight Loss vs. Body Composition

- Within the context of weight loss and obesity treatment:
 - Does Physical Activity

Enhance reduction in adiposity?

Enhance retention of lean mass?

Changes in Body Composition with Weight Loss

	Modest Reduction in Energy Intake ¹	Very Low Energy Diet (VLED) ²	GLP-1RA's ³
Change in Body Weight	-9.3%	-19.8%	~15% to 20%

¹Jakicic JM, Rogers RJ, Lang W, Gibbs BB, Yuan N, Fridman Y, Schelbert EB. Impact of weight loss with diet or diet plus physical activity on cardiac magnetic resonance imaging and cardiovascular disease risk factors: Heart Health Study randomized trial. Obesity (Silver Spring). 2022 May;30(5):1039-1056. PMID: 35470972; PMCID: PMC9813917.

²Donnelly JE, Pronk NP, Jacobsen DJ, Pronk SJ, Jakicic JM. Effects of a very-low-calorie diet and physical-training regimens on body composition and resting metabolic rate in obese females. Am J Clin Nutr. 1991 Jul;54(1):56-61. PMID: 2058588.

³Wadden TA, Chao AM, Moore M, Tronieri JS, Gilden A, Amaro A, Leonard S, Jakicic JM. The Role of Lifestyle Modification with Second-Generation Anti-obesity Medications: Comparisons, Questions, and Clinical Opportunities. Curr Obes Rep. 2023 Dec;12(4):453-473. PMID: 38041774; PMCID: PMC10748770.

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Percent of Weight Loss from the Reduction in Adipose Tissue	82.5%	77.4%	~60% to 75%

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Percent of Weight Loss from the Reduction in Adipose Tissue	82.5%	77.4%	~60% to 75%
Percent of Weight Loss from the Reduction in Lean Body Mass	16.5%	22.6%	~25% to 40%

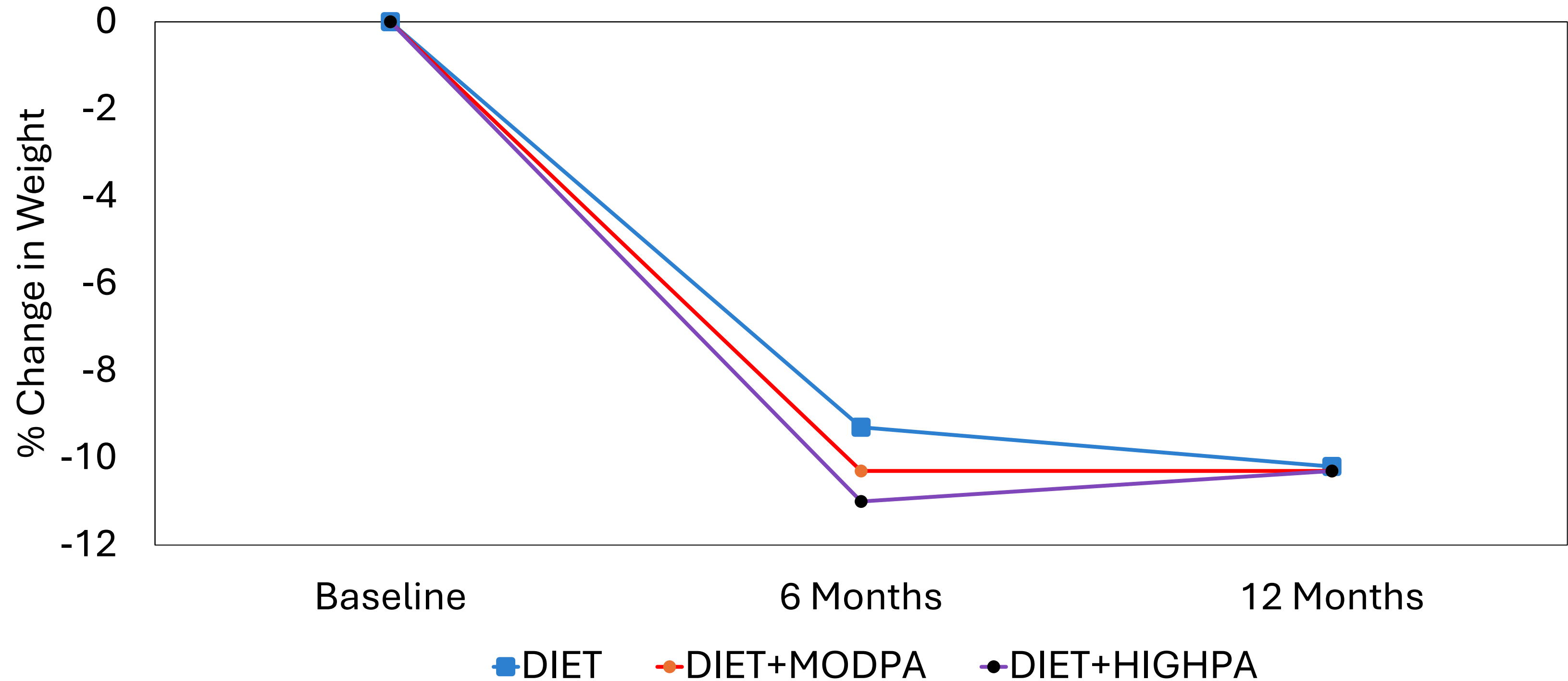
¹Jakicic JM, Rogers RJ, Lang W, Gibbs BB, Yuan N, Fridman Y, Schelbert EB. Impact of weight loss with diet or diet plus physical activity on cardiac magnetic resonance imaging and cardiovascular disease risk factors: Heart Health Study randomized trial. Obesity (Silver Spring). 2022 May;30(5):1039-1056. PMID: 35470972; PMCID: PMC9813917.

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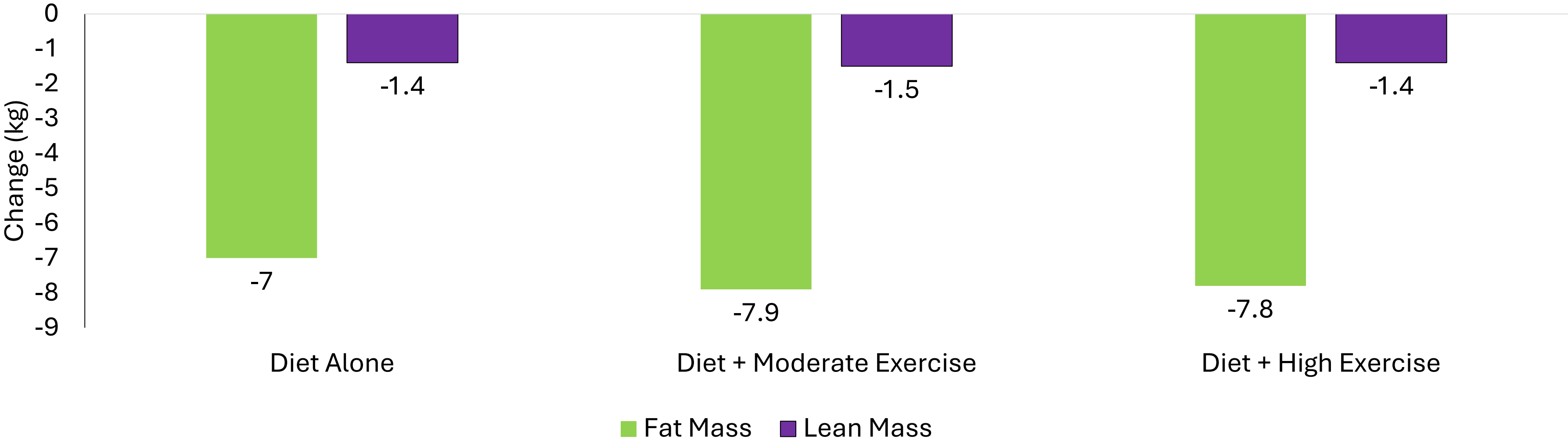
Weight Change



Jakicic et al. Obesity. 2022; 30(5): 1039-1056

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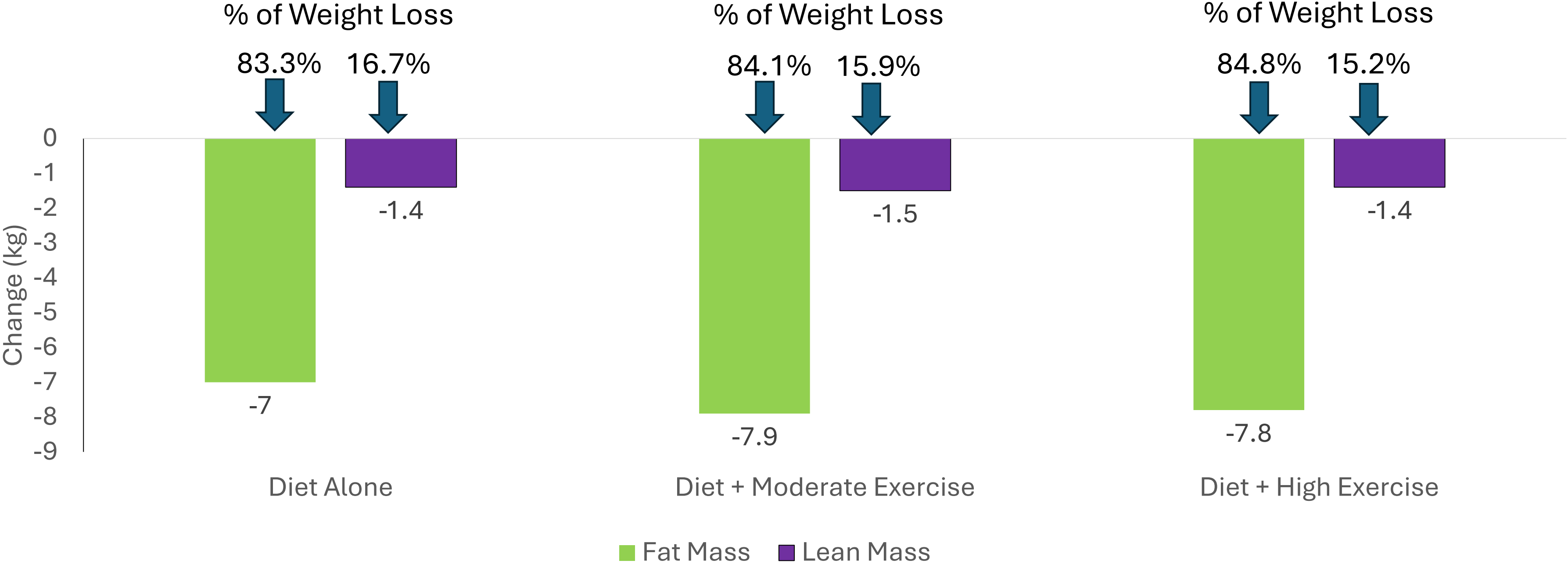
6-month Change in DXA Measured Body Composition with Diet-Induced or Diet+Exercise-Induced Weight Loss



Jakicic JM, Rogers RJ, Lang W, Gibbs BB, Yuan N, Fridman Y, Schelbert EB. Impact of weight loss with diet or diet plus physical activity on cardiac magnetic resonance imaging and cardiovascular disease risk factors: Heart Health Study randomized trial. *Obesity* (Silver Spring). 2022 May;30(5):1039-1056. doi: 10.1002/oby.23412. PMID: 35470972; PMCID: PMC9813917.

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Change in MRI Measured Body Composition with Diet-Induced or Exercise-Induced Weight Loss



Ross R, Dagnone D, Jones PJ, Smith H, Paddags A, Hudson R, Janssen I. Reduction in obesity and related comorbid conditions after diet-induced weight loss or exercise-induced weight loss in men. A randomized, controlled trial. Ann Intern Med. 2000 Jul 18;133(2):92-103. doi: 10.7326/0003-4819-133-2-200007180-00008. PMID: 10896648.

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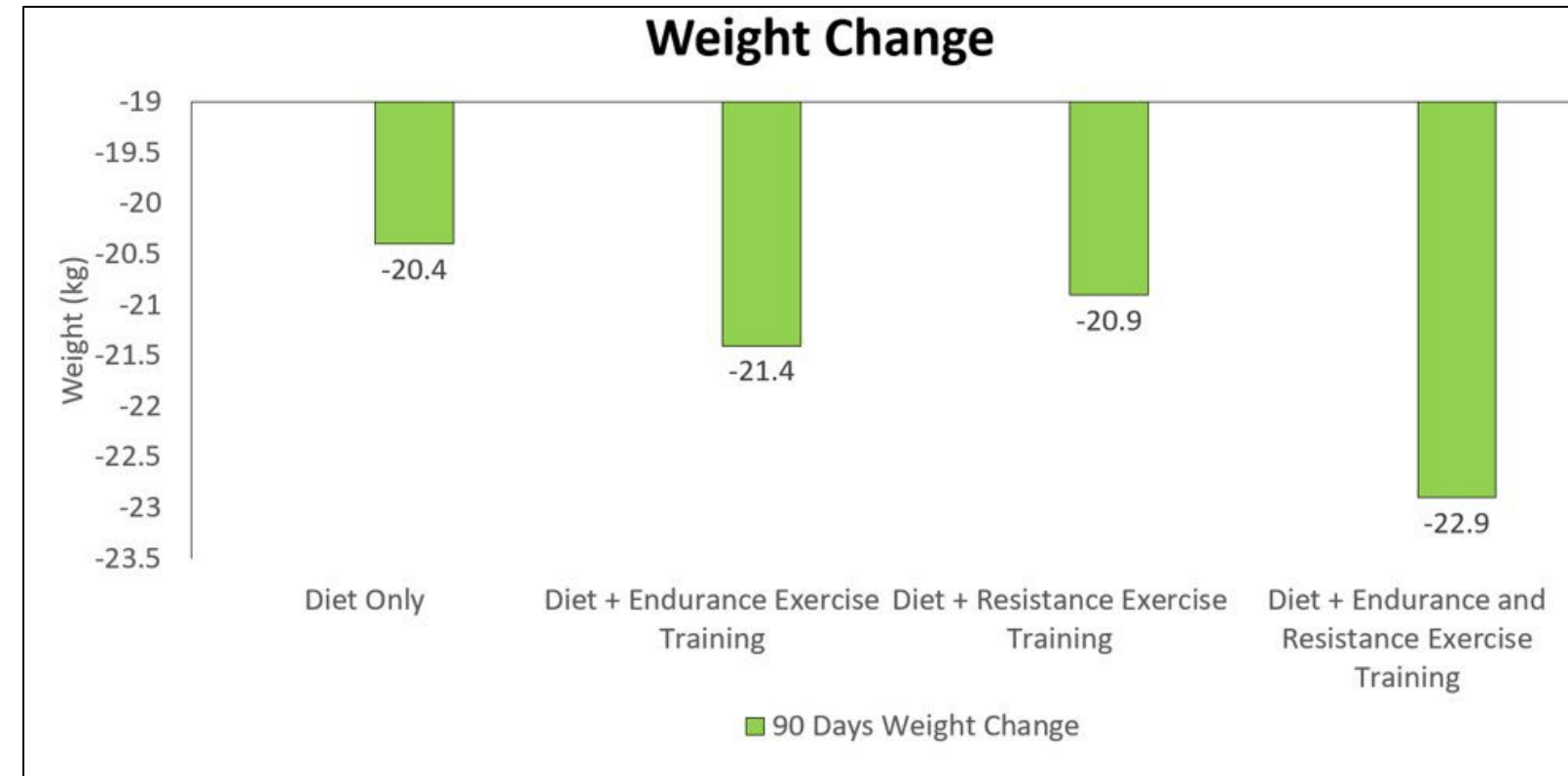
Changes with Very-Low Energy Diets (~500-800 kcal/day)

	Diet	Endurance Exercise Training	Resistance Exercise Training
Diet (VLED)	X		
Diet + Endurance Exercise Training	X	X	
Diet + Resistance Exercise Training	X		X
Diet + Endurance + Resistance Exercise Training	X	X	X

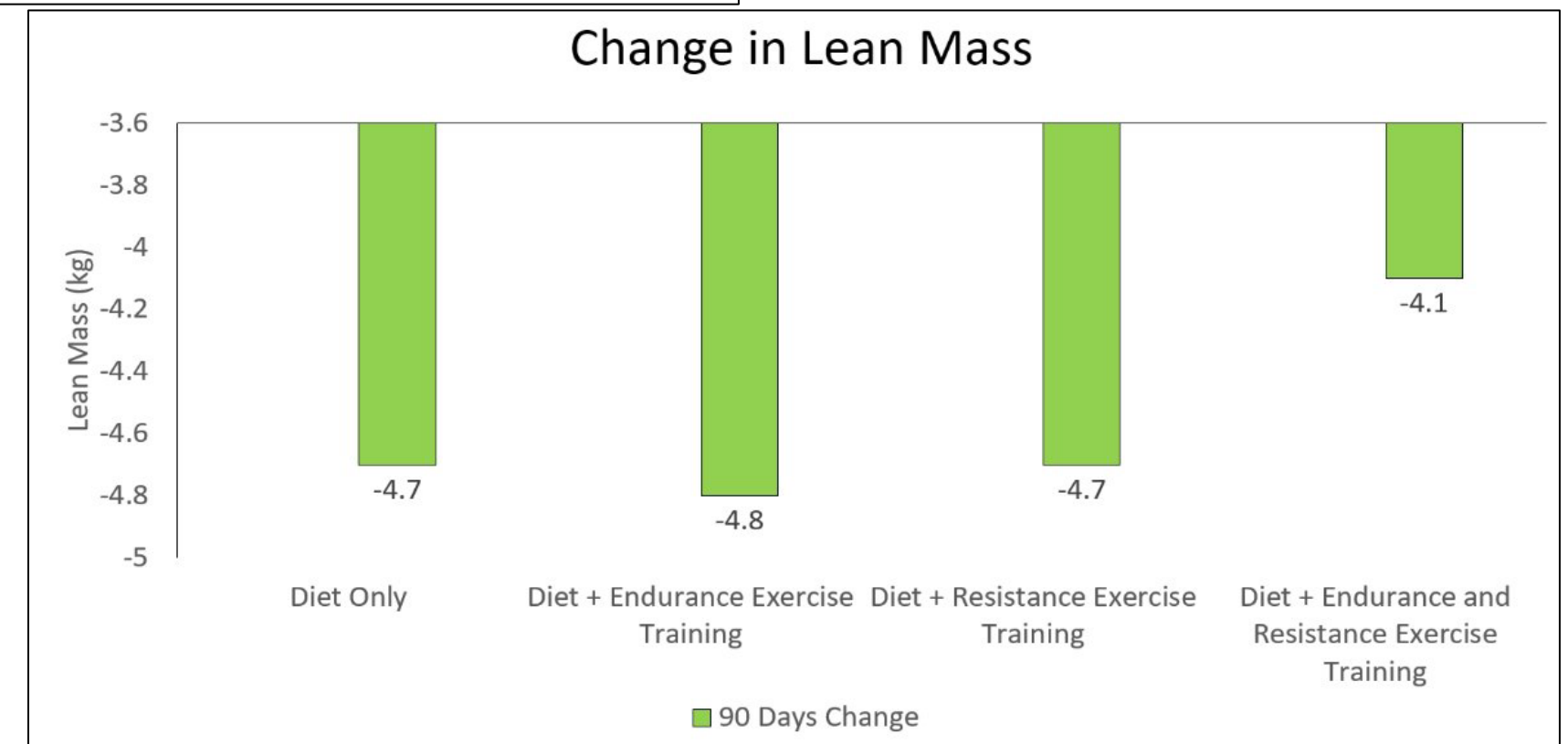
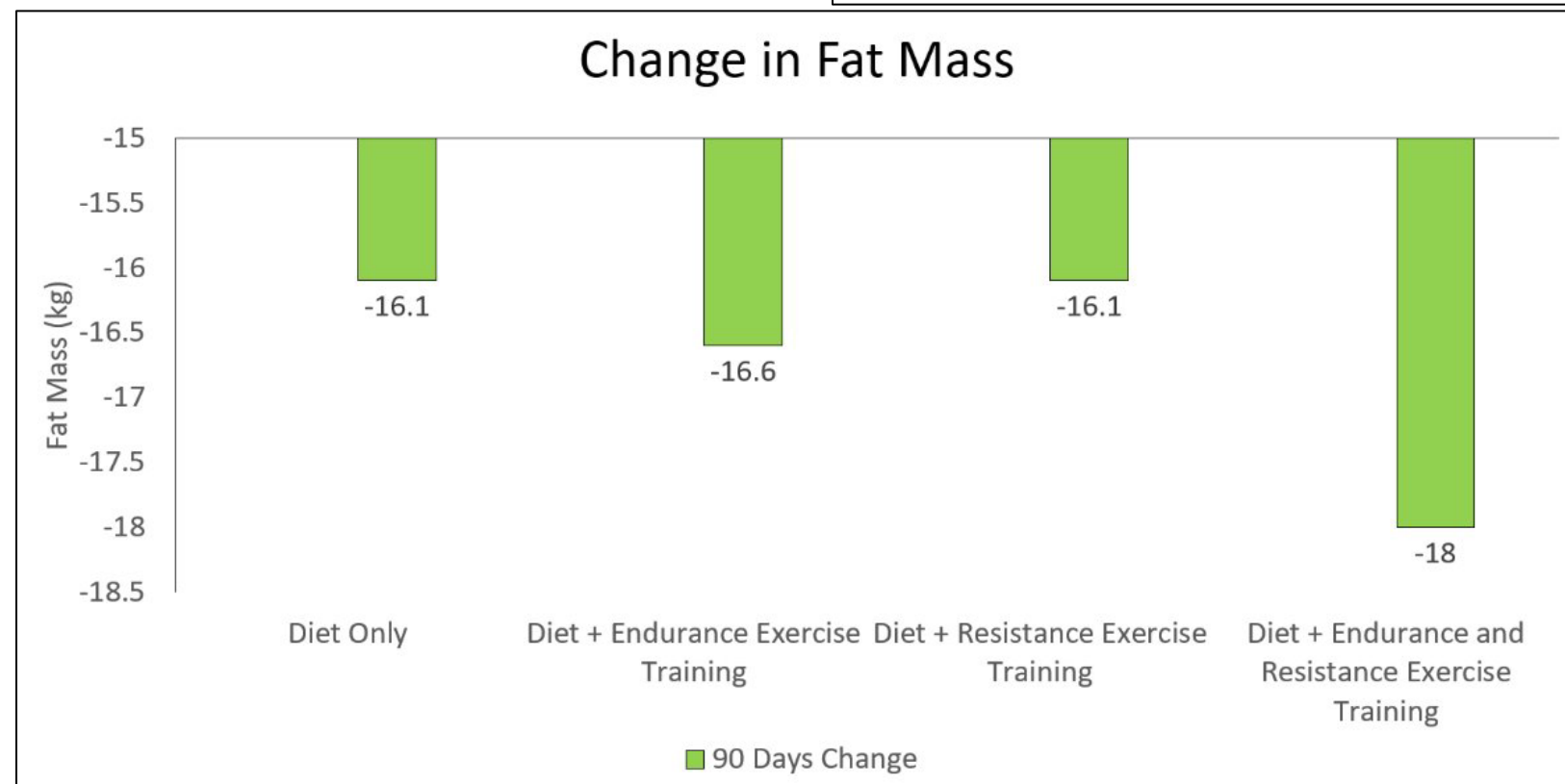
Donnelly et al. Am J Clin Nutr. 1991; 54:56-61.

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Changes with Very-Low Energy Diets (~500-800 kcal/day)



No significant effect of exercise on change in weight or body composition.

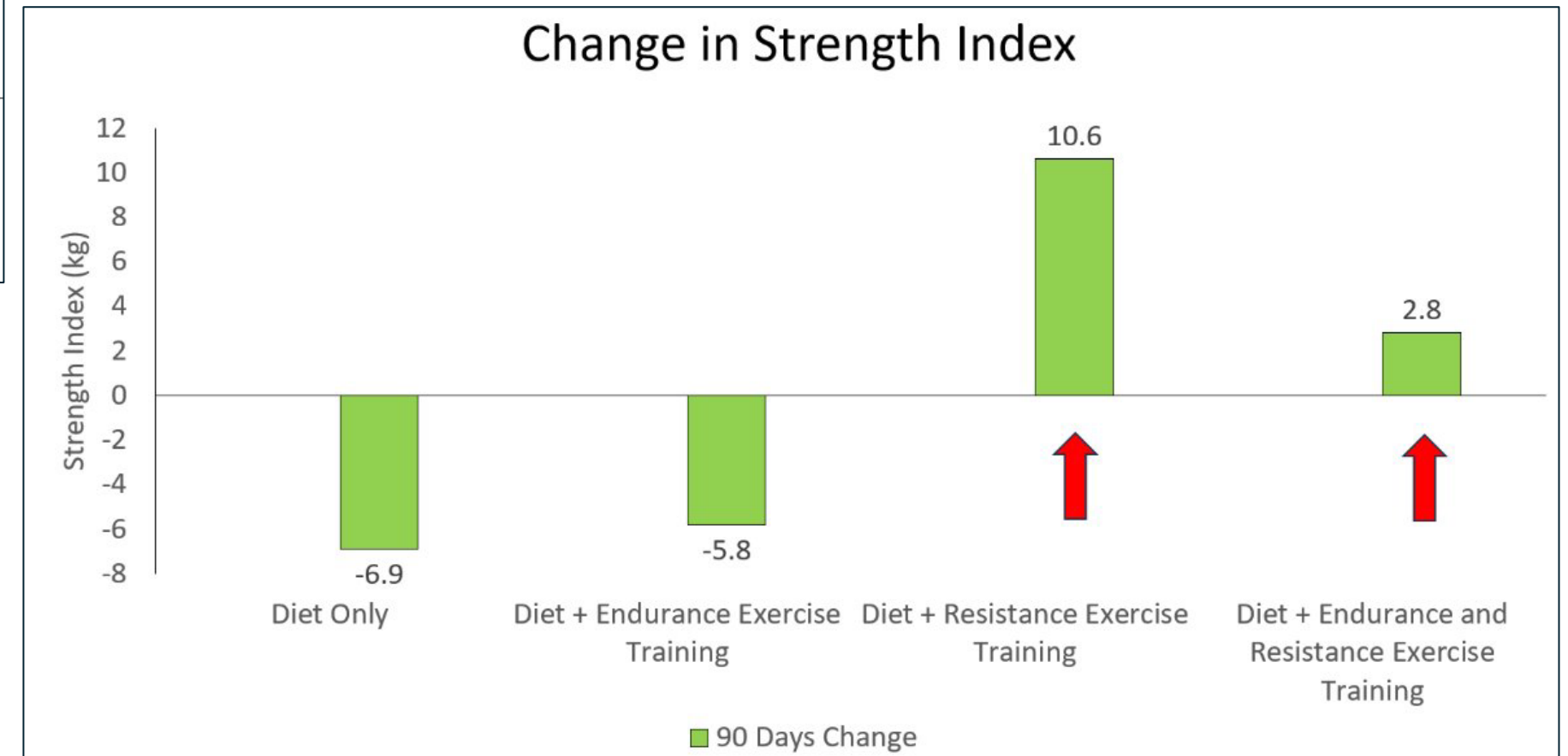
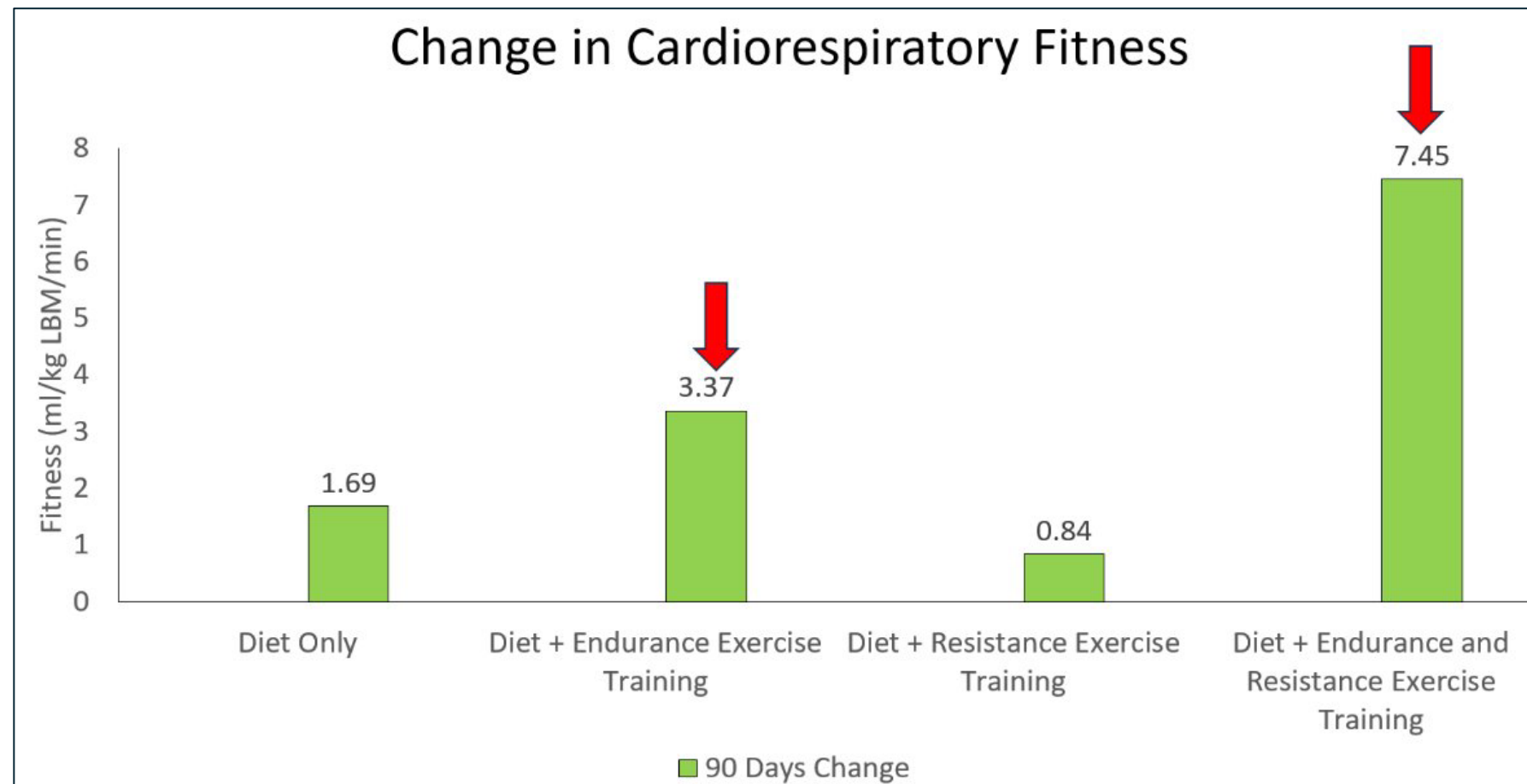


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Bariatric Surgery and Exercise

6 Month Change in Weight and Body Composition in Response to Bariatric Surgery – With and Without Exercise.

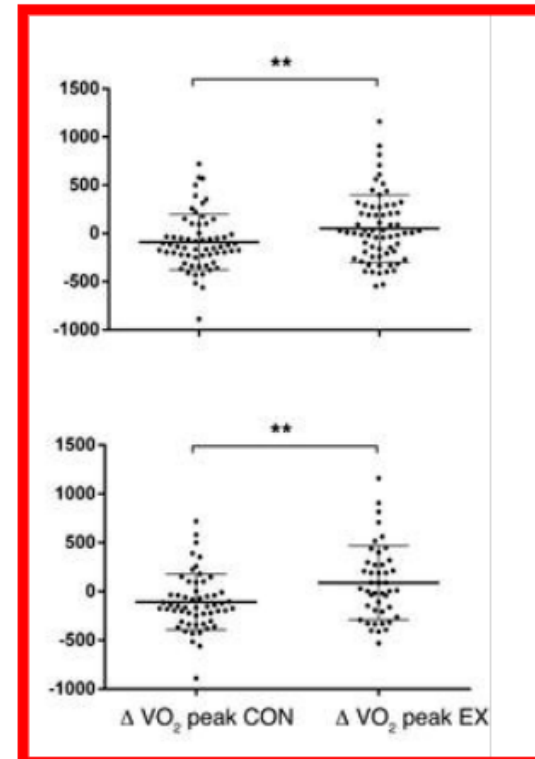
Weight, body composition, and cardiorespiratory fitness, mean (SD)	CON (n = 56)		EX (n = 44)		Group	P value Time	Group × time
	Before	After	Before	After			
Weight, kg	106.3 (25.8)	84.2 (21.3) ^a	108.3 (21.3)	84.3 (17.2) ^a	0.98	<0.001	0.30
BMI, kg/m ²	38.4 (7.1)	30.4 (5.6) ^a	38.3 (5.9)	29.9 (5.1) ^a	0.73	<0.001	0.44
Waist circumference, cm	110.6 (15.4)	94.7 (12.7) ^a	112.9 (16.7)	94.9 (13.2) ^a	0.89	<0.001	0.29
Fat mass, kg	50.4 (15.2)	31.2 (11.0) ^a	50.7 (10.3)	30.1 (10.2) ^a	0.95	<0.001	0.31
Lean mass, kg	49.8 (9.6)	48.7 (9.4) ^a	50.8 (8.2)	49.8 (7.5)	0.79	0.002	0.86
Total fat, cm ²	692.6 (164.0)	431.8 (143.9) ^a	707.3 (150.9)	430.2 (185.9) ^a	0.97	<0.001	0.34

Exercise added to Bariatric Surgery DID NOT alter Body Composition differently than Bariatric Surgery without Exercise

Coen et al. J Clin Invest. 2014. DOI: 10.1172/JCI78016

6 Month Change in Cardiorespiratory Fitness in Response to Bariatric Surgery – With and Without Exercise.

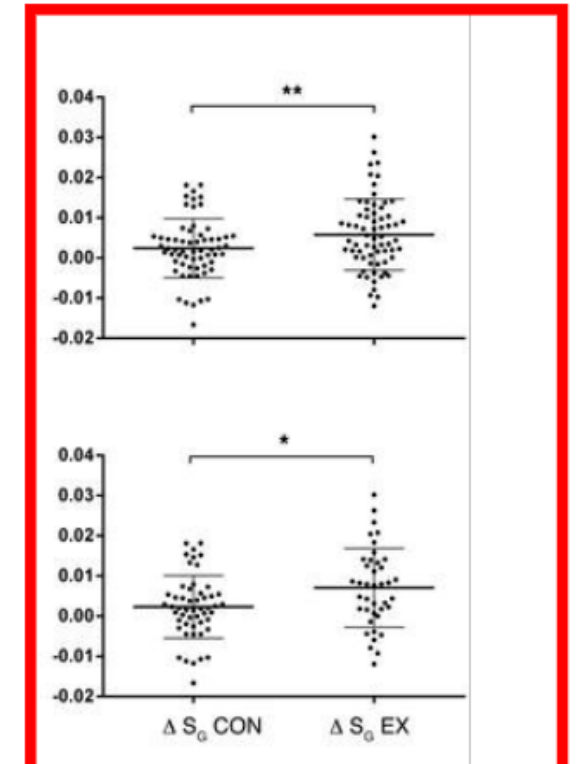
Exercise added to Bariatric Surgery ENHANCED Cardiorespiratory Fitness compared to Bariatric Surgery without Exercise



Coen et al. J Clin Invest. 2014. DOI: 10.1172/JCI78016

6 Month Change in Insulin Sensitivity in Response to Bariatric Surgery – With and Without Exercise.

Exercise added to Bariatric Surgery ENHANCED Insulin Sensitivity compared to Bariatric Surgery without Exercise



Coen et al. J Clin Invest. 2014. DOI: 10.1172/JCI78016

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Weight Loss vs. Body Composition

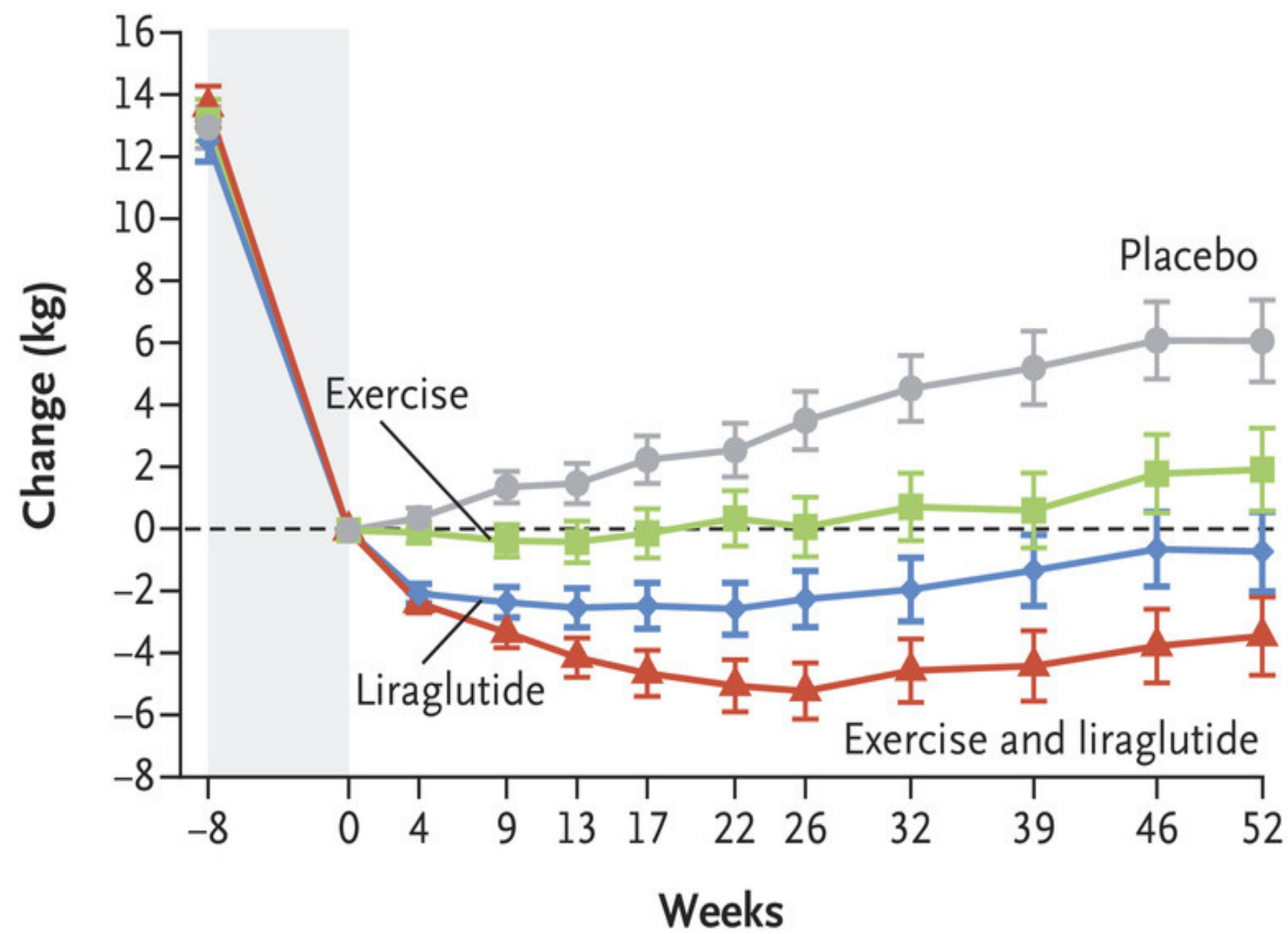
- Lean body mass $\neq$ Muscle Mass
- Volume vs. Quality of Tissue

There have been no peer-reviewed published studies examining the effects of exercise on body composition (and specifically muscle quantity and quality) in patients undertaking a GLP-1RA at the onset of weight loss treatment!

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Exercise Effects Combined with Obesity Medication

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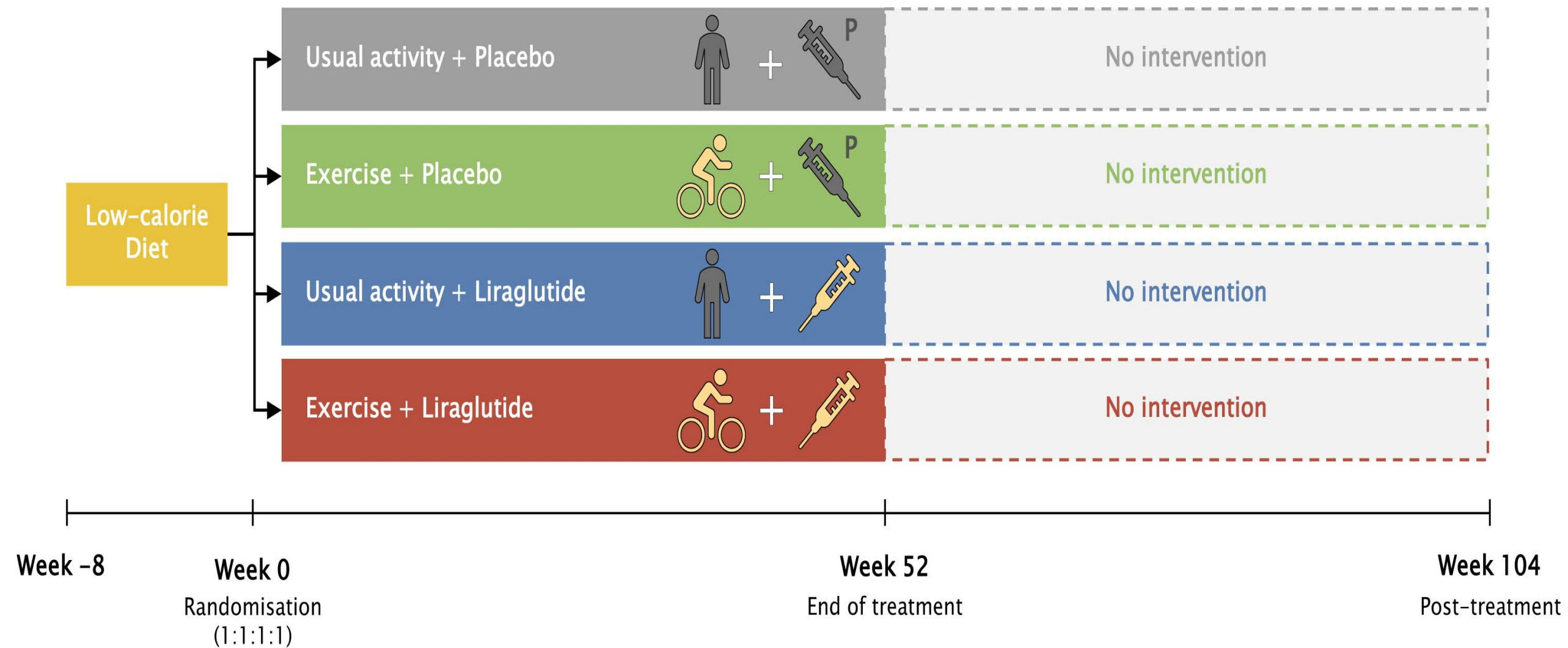


ORIGINAL ARTICLE

Healthy Weight Loss Maintenance with Exercise, Liraglutide, or Both Combined

Julie R. Lundgren, M.D., Ph.D., Charlotte Janus, Ph.D., Simon B.K. Jensen, M.Sc., Christian R. Juhl, M.D., Lisa M. Olsen, M.Sc., Rasmus M. Christensen, B.Sc.Med., Maria S. Svane, M.D., Ph.D., Thomas Bandholm, Ph.D., Kirstine N. Bojsen-Møller, M.D., Ph.D., Martin B. Blond, M.D., Ph.D., Jens-Erik B. Jensen, M.D., Ph.D., Bente M. Stallknecht, M.D., D.M.Sc., et al.

Exercise Effects Combined with AOM

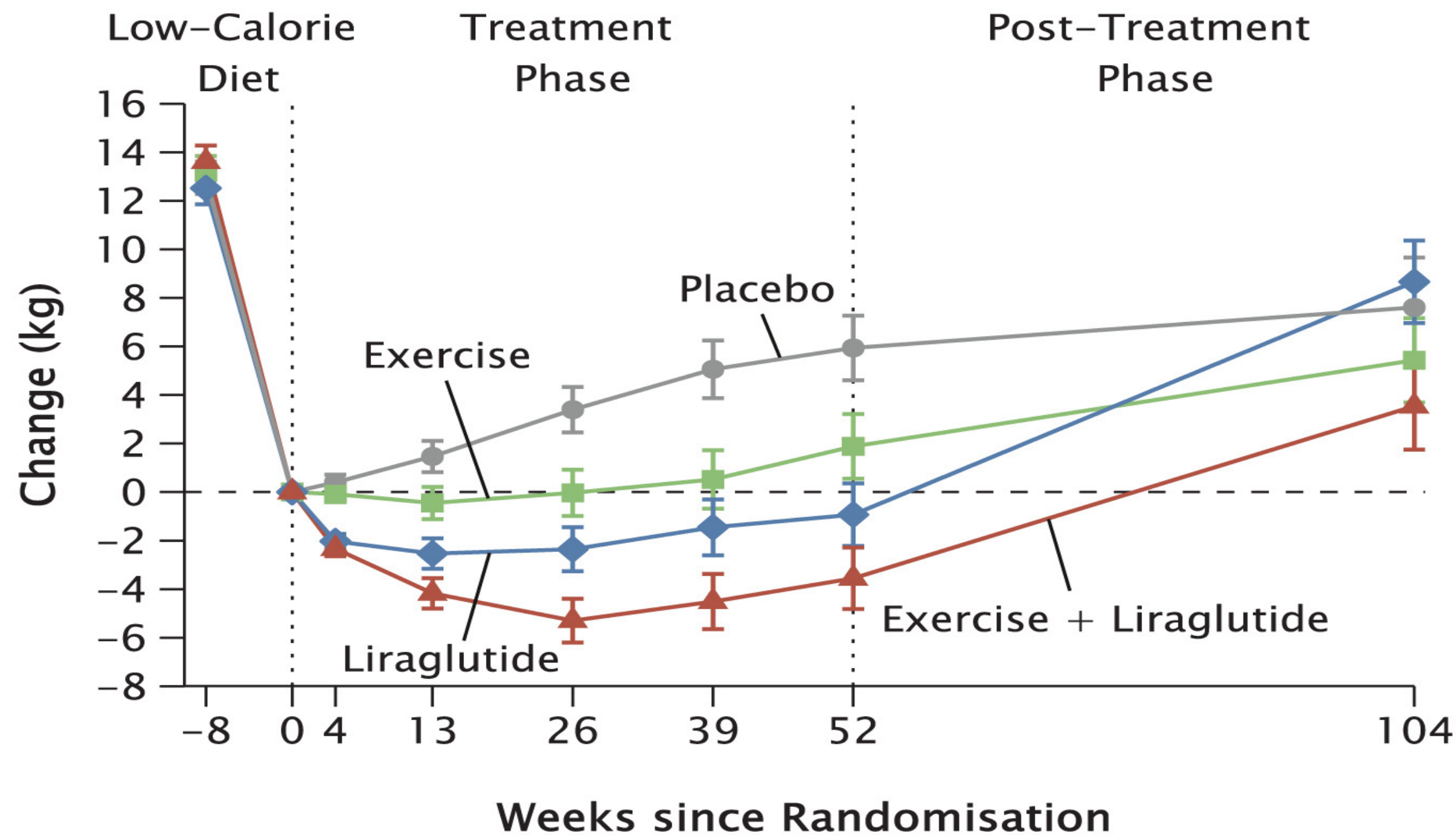


Jensen SBK, Blond MB, Sandsdal RM, Olsen LM, Juhl CR, Lundgren JR, Janus C, Stallknecht BM, Holst JJ, Madsbad S, Torekov SS. Healthy weight loss maintenance with exercise, GLP-1 receptor agonist, or both combined followed by one year without treatment: a post-treatment analysis of a randomised placebo-controlled trial. *EClinicalMedicine*. 2024 Feb 19;69:102475. doi: 10.1016/j.eclinm.2024.102475. PMID: 38544798; PMCID: PMC10965408.

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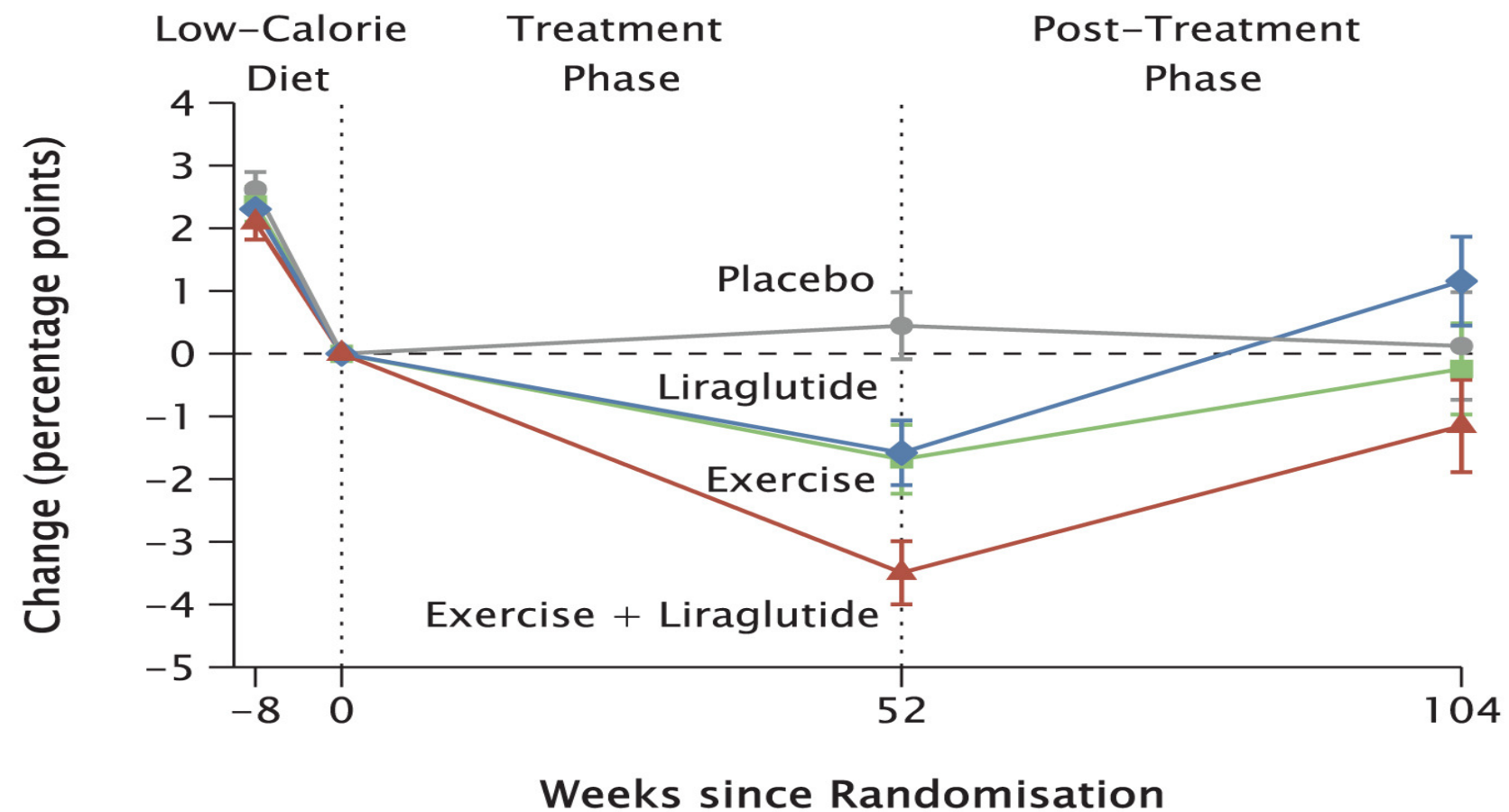
A Body Weight Change from Randomisation (Week 0)



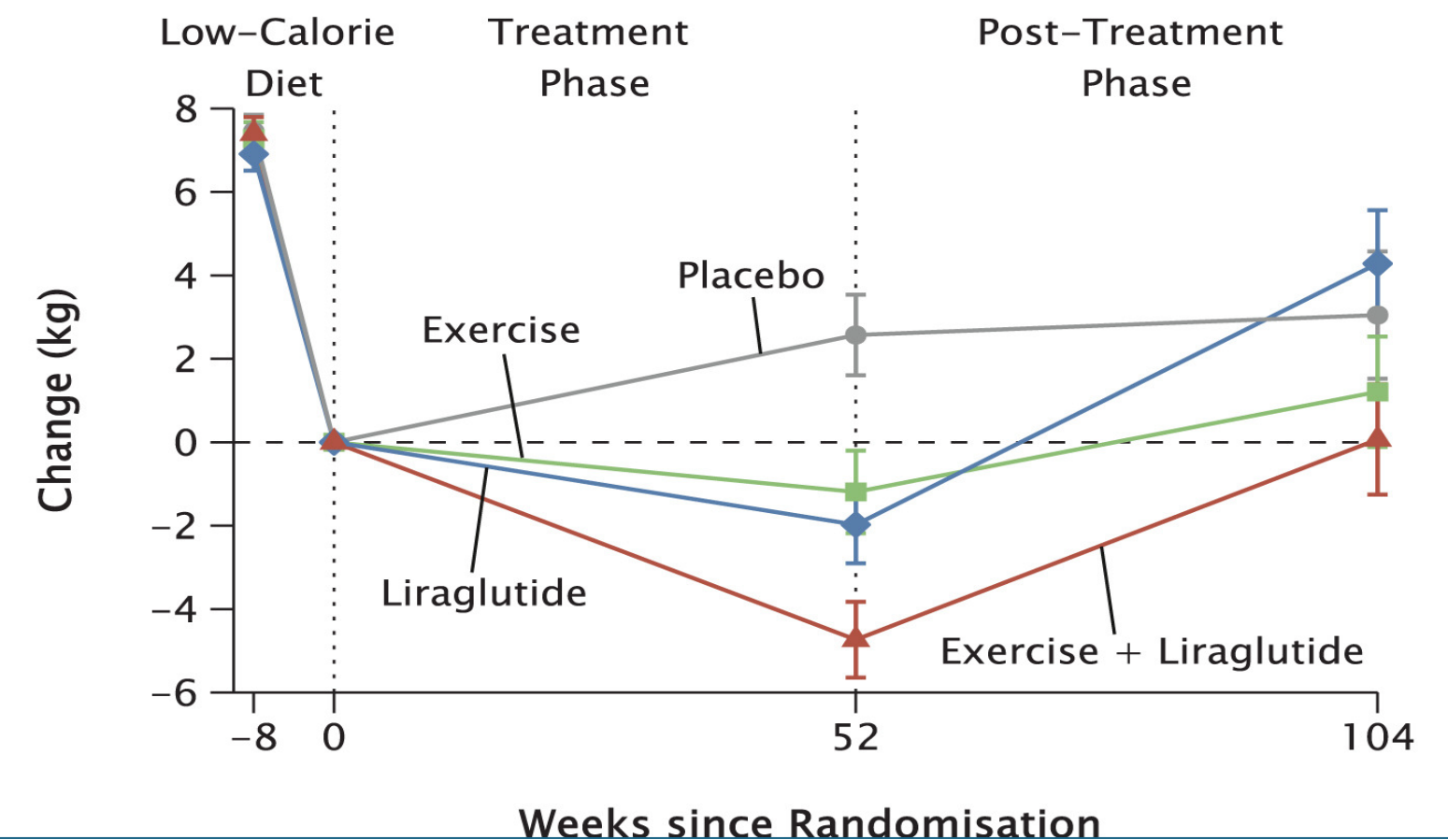
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Exercise Effects Combined with AOM

Body-Fat Percentage Change from Randomisation (Week 0)



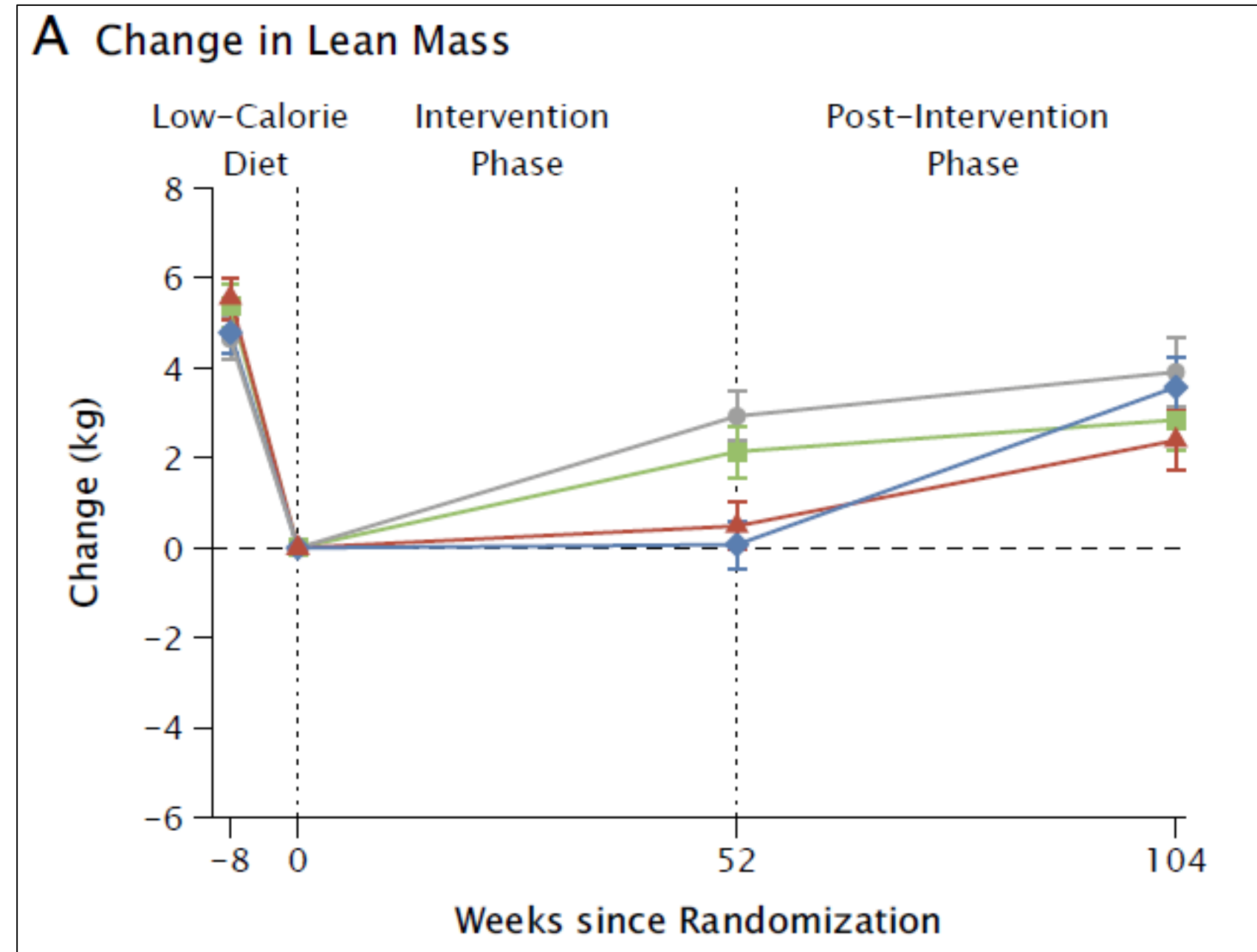
Change in Fat Mass from Randomisation



Jensen SBK, Blond MB, Sandsdal RM, Olsen LM, Juhl CR, Lundgren JR, Janus C, Stallknecht BM, Holst JJ, Madsbad S, Torekov SS. Healthy weight loss maintenance with exercise, GLP-1 receptor agonist, or both combined followed by one year without treatment: a post-treatment analysis of a randomised placebo-controlled trial. *EClinicalMedicine*. 2024 Feb 19;69:102475. doi: 10.1016/j.eclinm.2024.102475. PMID: 38544798; PMCID: PMC10965408.

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Exercise Effects Combined with AOM



“All groups had similar increases in lean mass.”

Jensen SBK, Blond MB, Sandsdal RM, Olsen LM, Juhl CR, Lundgren JR, Janus C, Stallknecht BM, Holst JJ, Madsbad S, Torekov SS. Healthy weight loss maintenance with exercise, GLP-1 receptor agonist, or both combined followed by one year without treatment: a post-treatment analysis of a randomised placebo-controlled trial. *EClinicalMedicine*. 2024 Feb 19;69:102475. doi: 10.1016/j.eclinm.2024.102475. PMID: 38544798; PMCID: PMC10965408.

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Cardiovascular Health

Considerations Beyond Weight Loss

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Heart Health Study

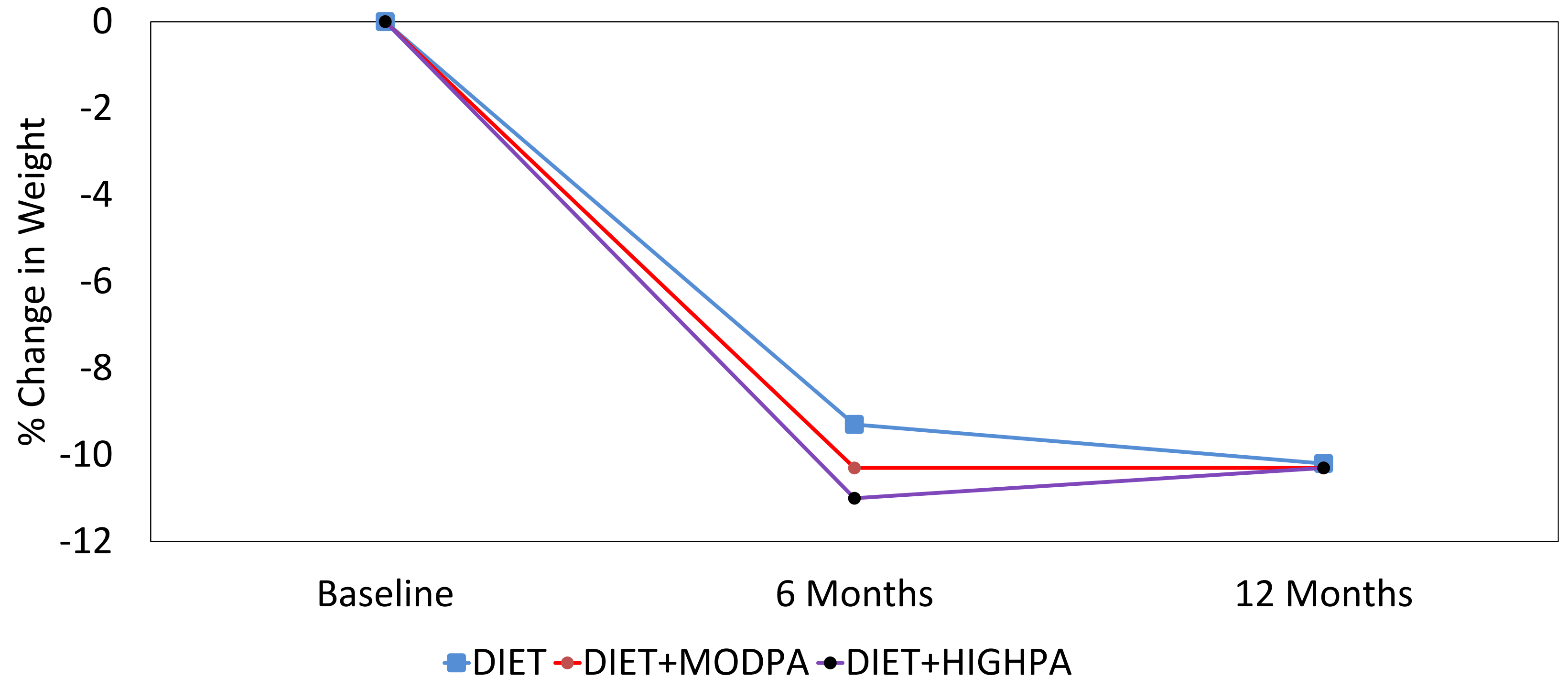
Intervention Components

	Diet Group	Diet + Moderate Dose of Physical Activity	Diet + High Dose of Physical Activity
Behavioral Support Sessions	☑	☑	☑
Dietary Intake: Prescribed at 1200-1800 kcal/day	☑	☑	☑
Progression to 150 min/week or moderate-intensity physical activity		☑	
Progression to 250 min/week of moderate-intensity physical activity			☑

Jakicic et al. Obesity. 2022; 30(5): 1039-1056

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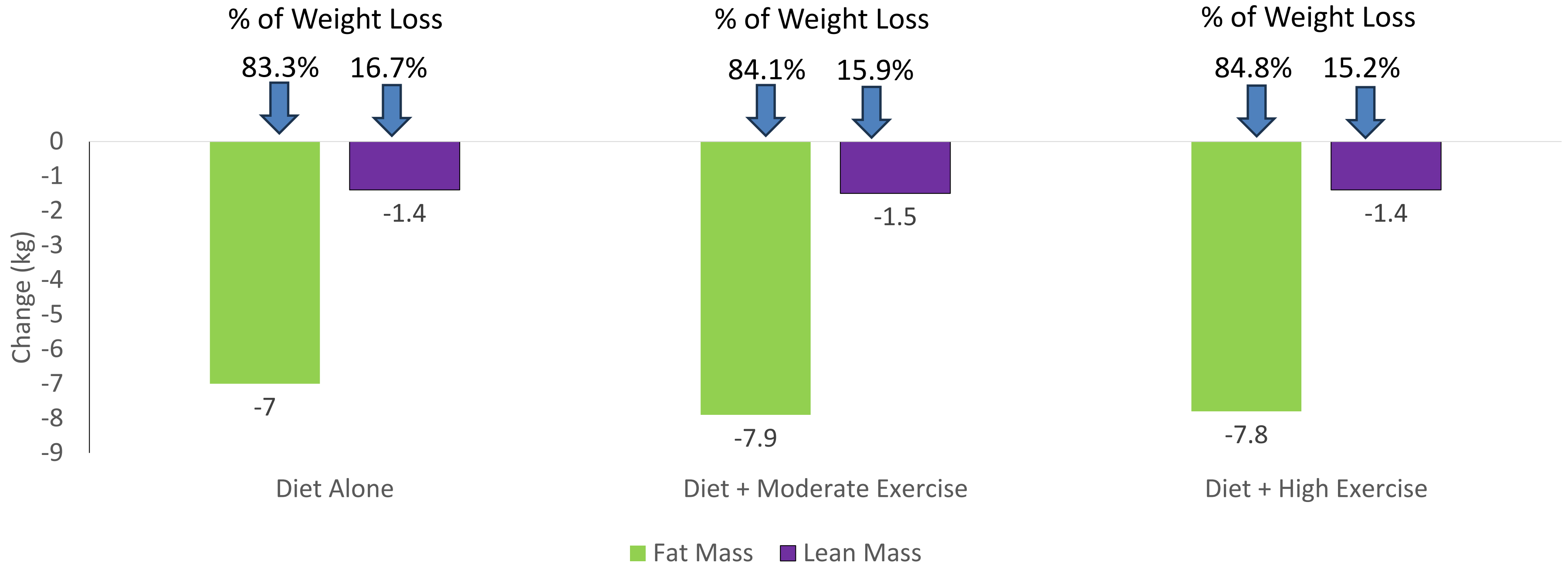
Weight Change



Jakicic et al. Obesity. 2022; 30(5): 1039-1056

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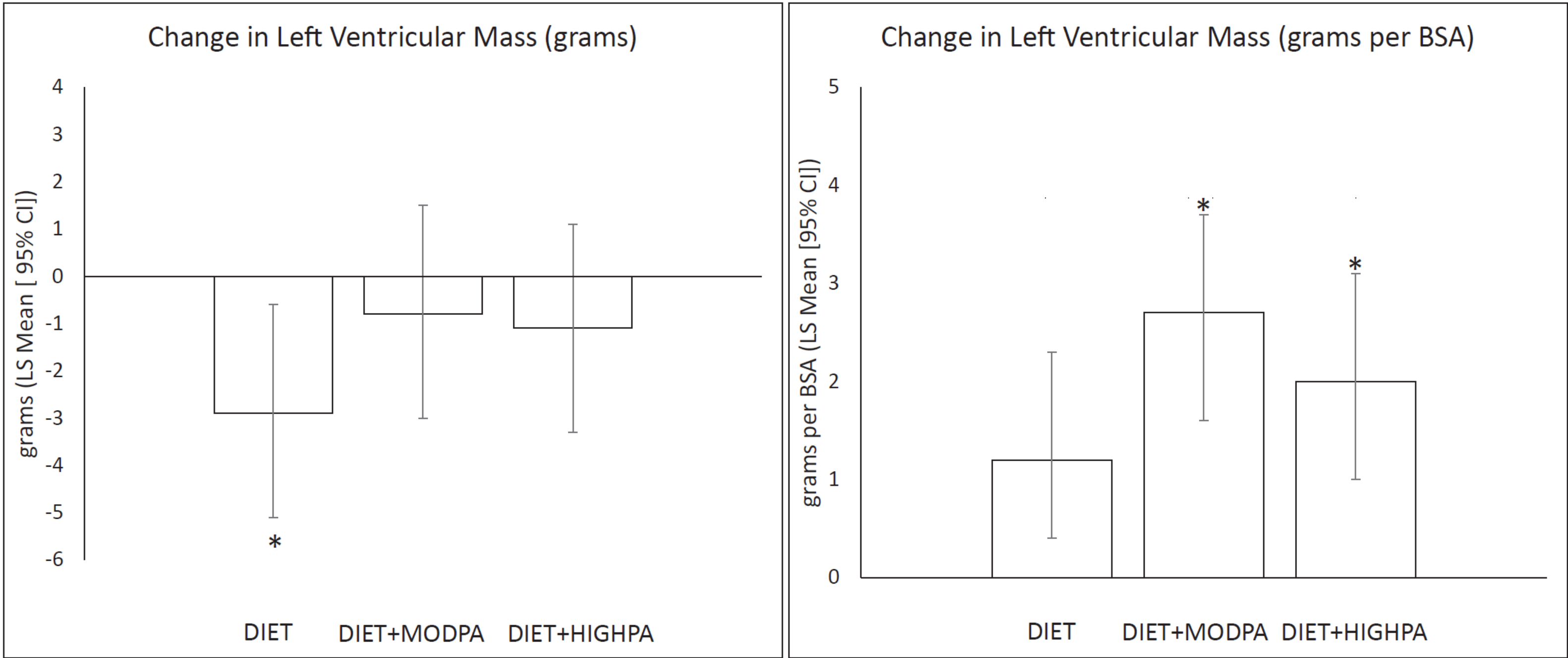
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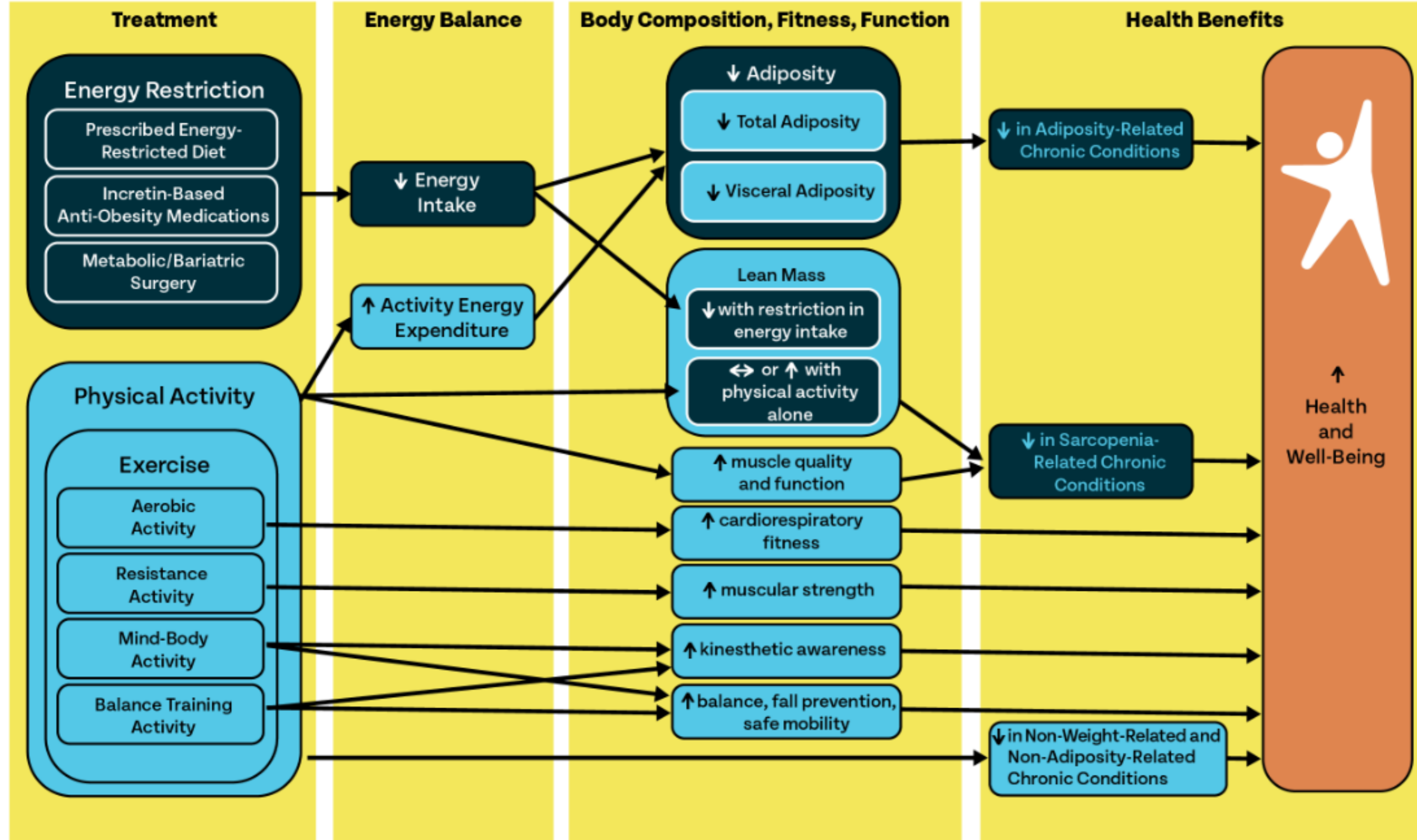
Change in Left Ventricular Mass



*indicates significant change from baseline

Jakicic et al. Obesity. 2022; 30(5): 1039-1056

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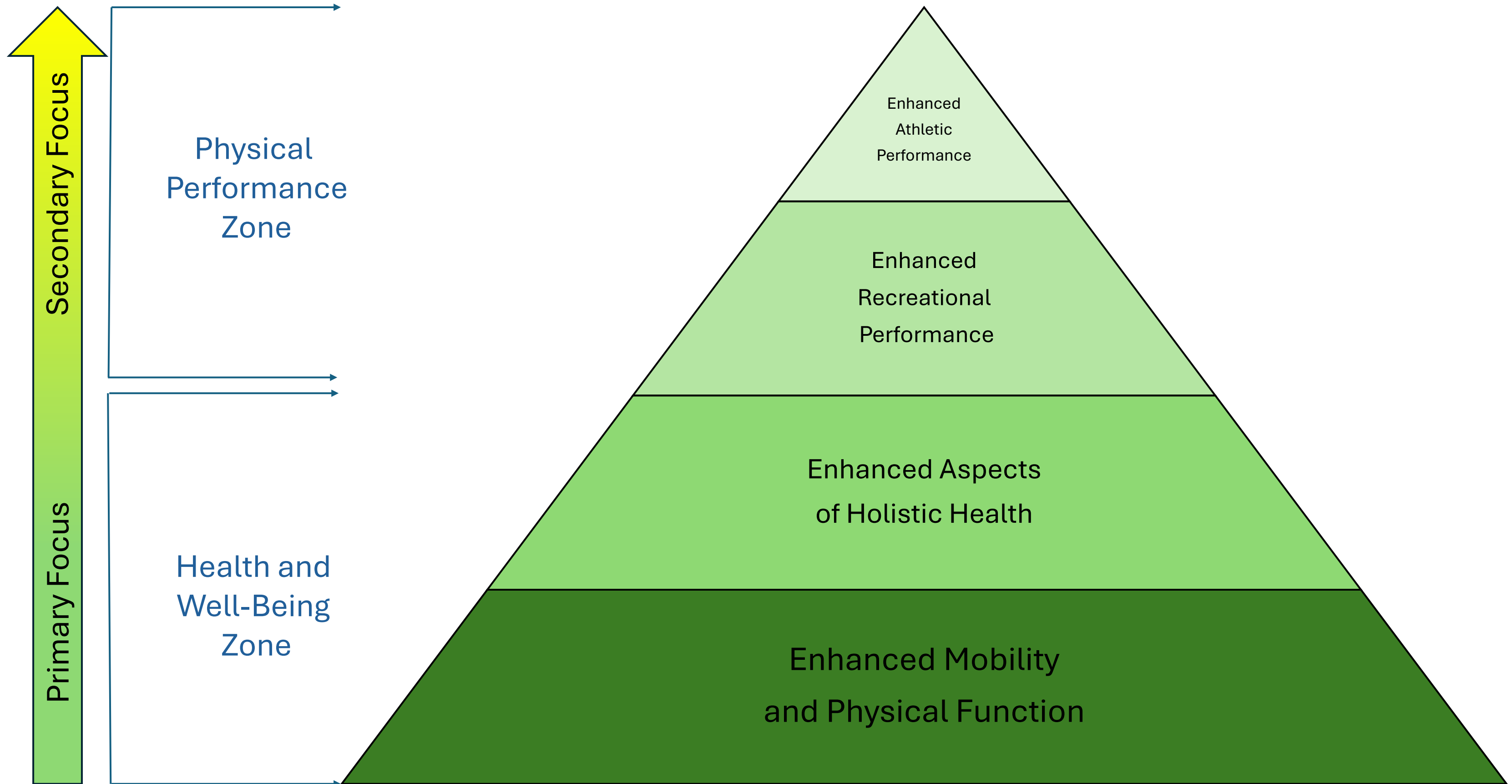


Jakicic JM, Apovian CM, Barr-Anderson DJ, Courcoulas AP, Donnelly JE, Ekkekakis P, Hopkins M, Lambert EV, Napolitano MA, Volpe SL. Physical Activity and Excess Body Weight and Adiposity for Adults. American College of Sports Medicine Consensus Statement. Translational Journal of the American College of Sports Medicine; Medicine and Science in Sports and Exercise

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Additional Considerations for Patients with Obesity

- What is the targeted outcome?
 - Exercise performance?
 - Holistic health of a patient with obesity?



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Additional Considerations for Patients with Obesity

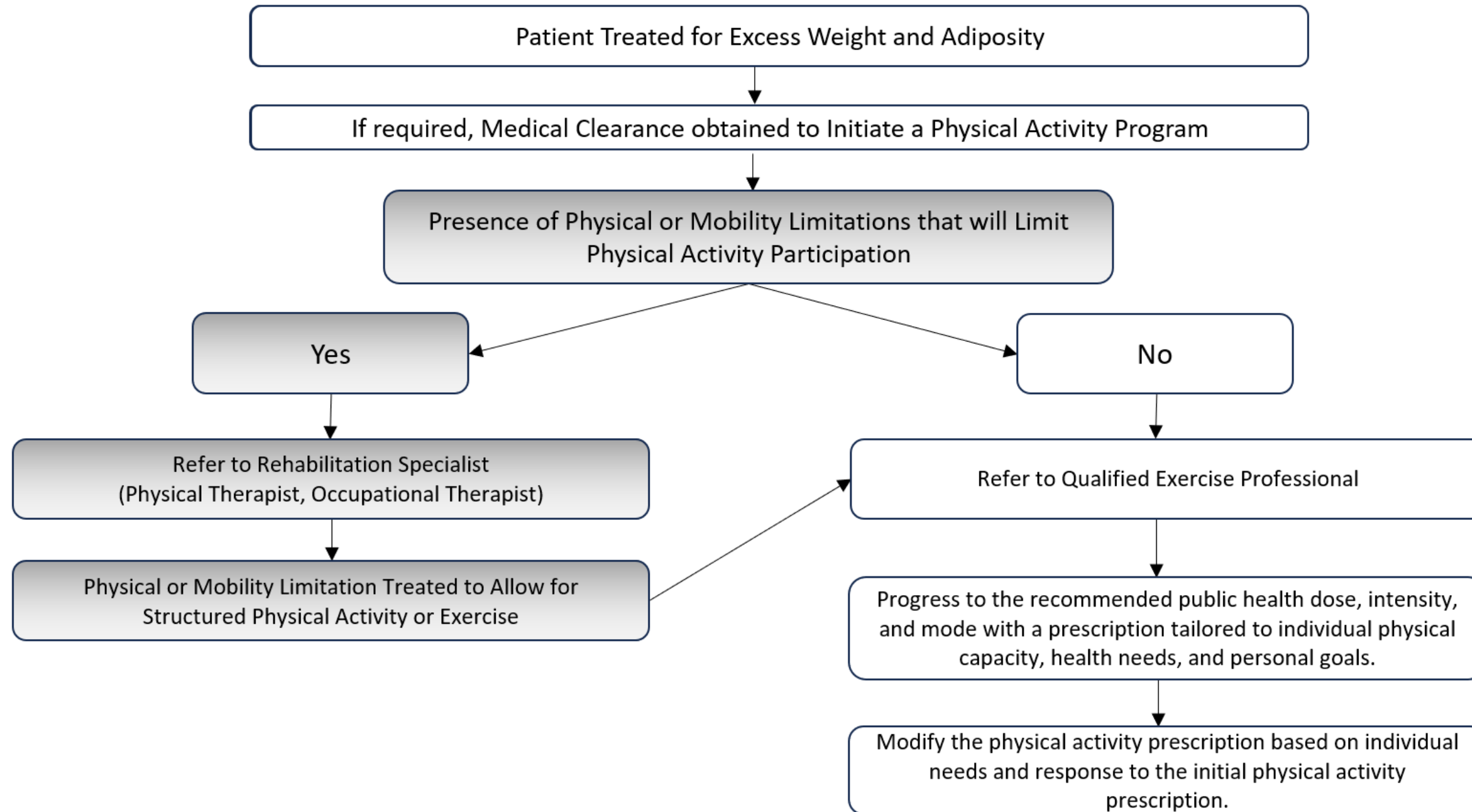
- What is the targeted outcome?
 - Exercise performance?
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- Are there other health considerations to consider?
 - Presence of other health risk factors
 - Presence of other chronic health conditions.

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 - Presence of other chronic health conditions.
- Are there mobility limitations?

Assess for Physical or Mobility Limitations

Framework for prescription and profession of physical activity for patients receiving obesity treatment.



Adapted from: Jakicic JM, Rogers RJ, Apovian CM. Contemporary treatments for obesity: Physical activity in the context of anti-obesity medications. *Translational Journal of the American College of Sports Medicine*. 2024; 9(2):2379-2868/0902/e000253.

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Additional Considerations for Patients with Obesity

- What is the targeted outcome?
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 - Holistic health of a patient with obesity?
- Are there other health considerations to consider?
 - Presence of other health risk factors
 - Presence of other chronic health conditions.
- Are there mobility limitations?
- Are the equipment and facilities appropriate for the individual patient with obesity?

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Additional Considerations for Patients with Obesity

- Who is providing the physical activity guidance?
 - Social media influencer?
 - Healthcare provider?
 - Qualified (appropriately certified and trained) exercise professional to assist patients with obesity?

What Should Be the Focus?

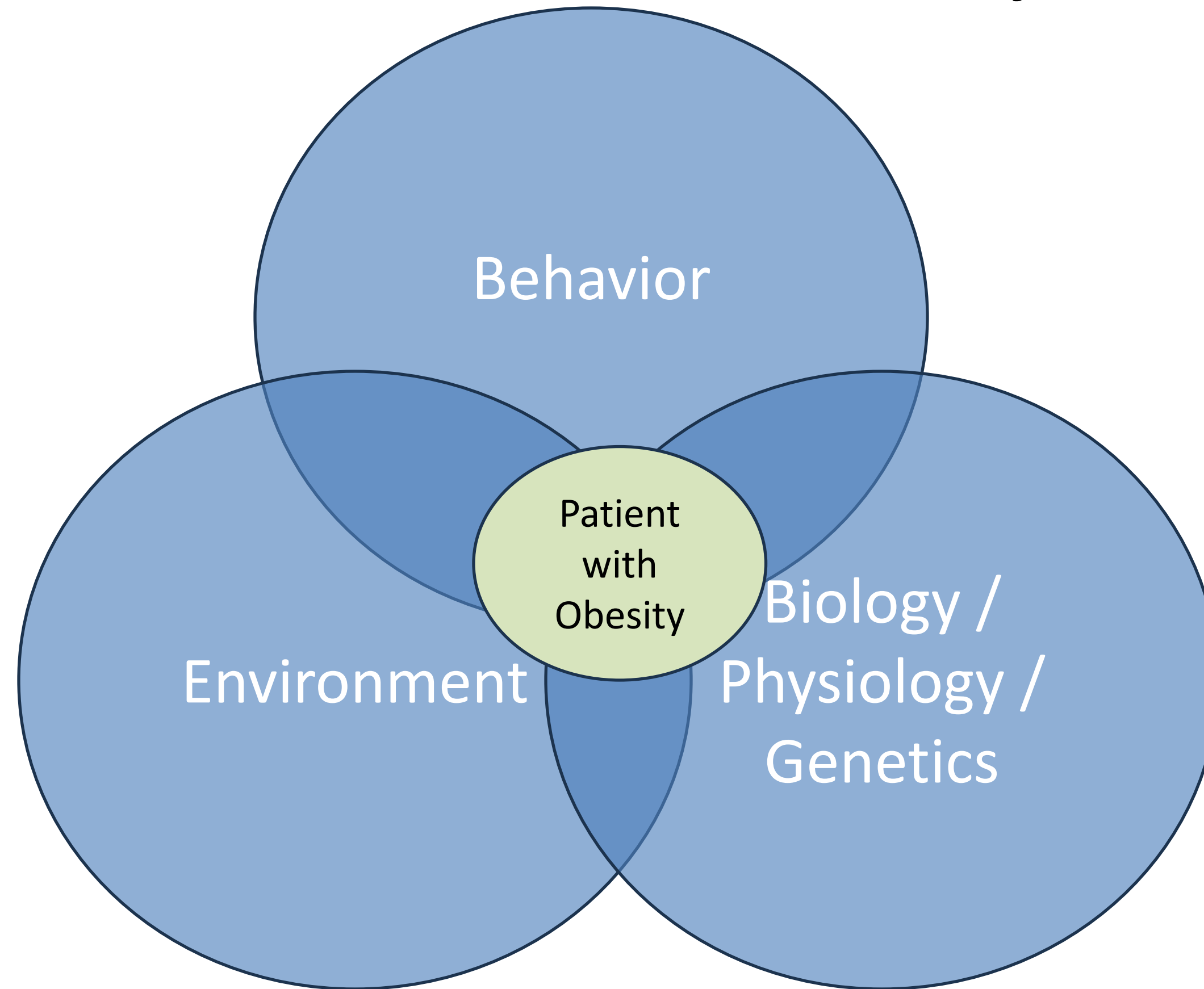
Weight Focused → Adiposity Focused → Health Focused



Physical Activity is Key!

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Causes / Contributors to Obesity



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Thank You!

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