



Carbs, Calories, or Quality? What Matters Most for Weight Control

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National Institutes of Health

April 23, 2018



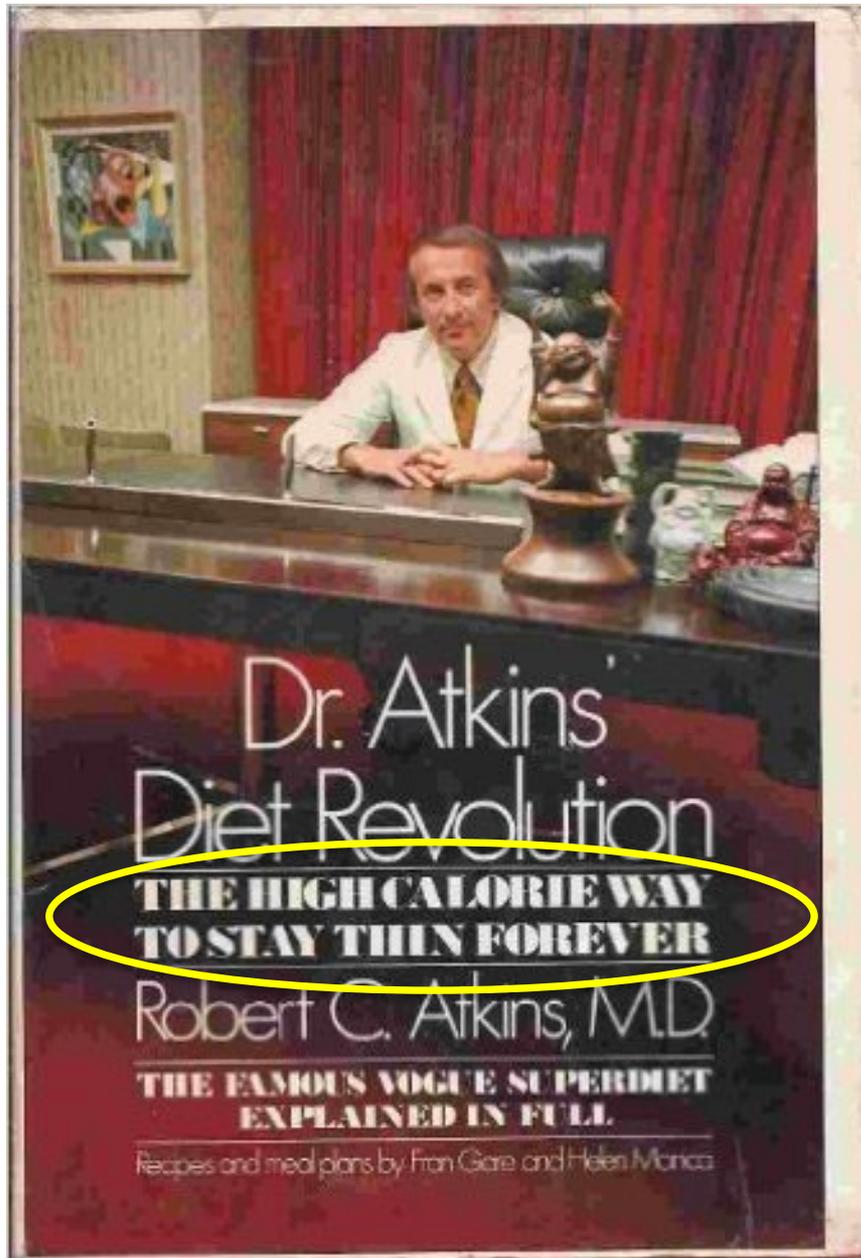
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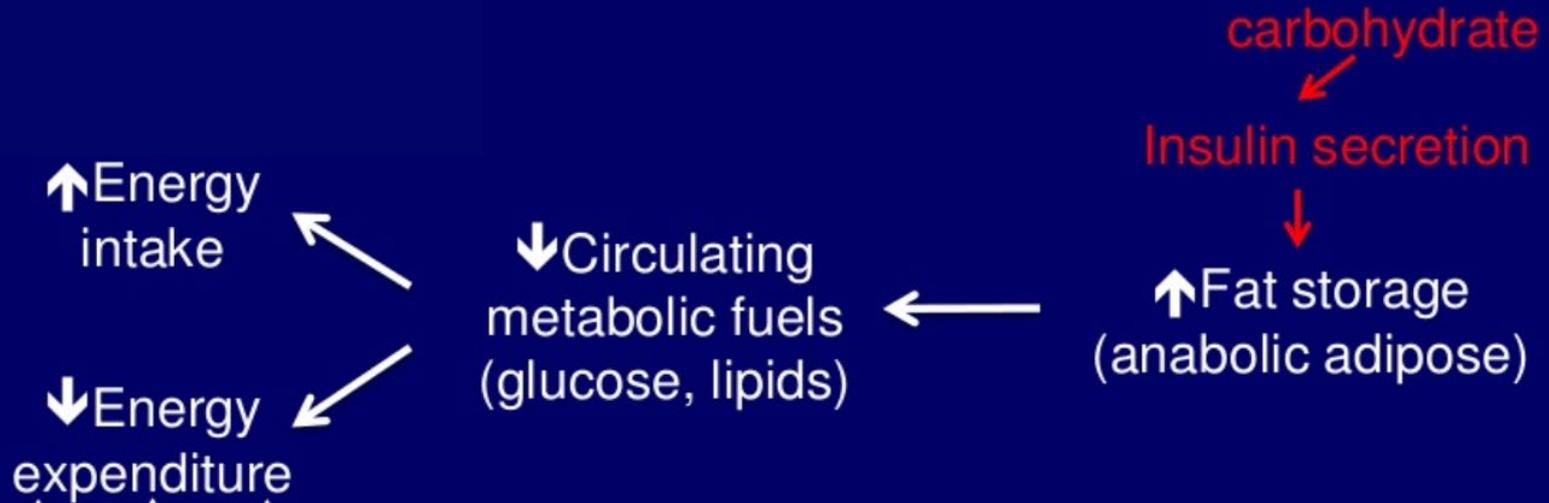


The Promise of Low Carb Diets



Carbohydrate-Insulin Model of Obesity

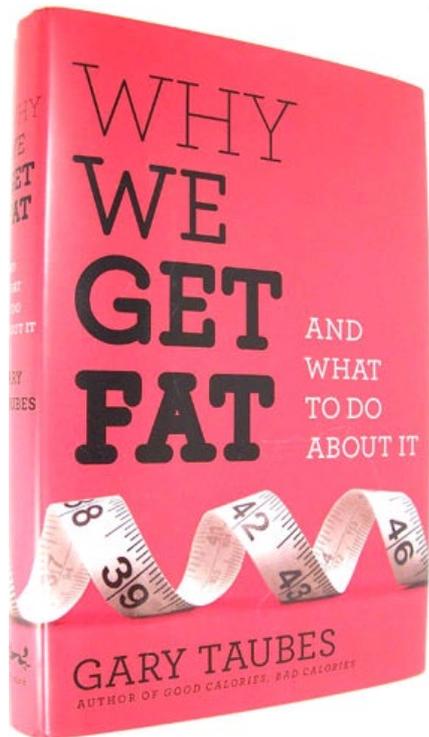
Excessive anabolic drive in adipose tissue



“the metabolic effects of carbohydrate [to increase insulin] cause the adipocyte to take in, store, and trap too many calories. Subsequently, energy expenditure declines and hunger increases”

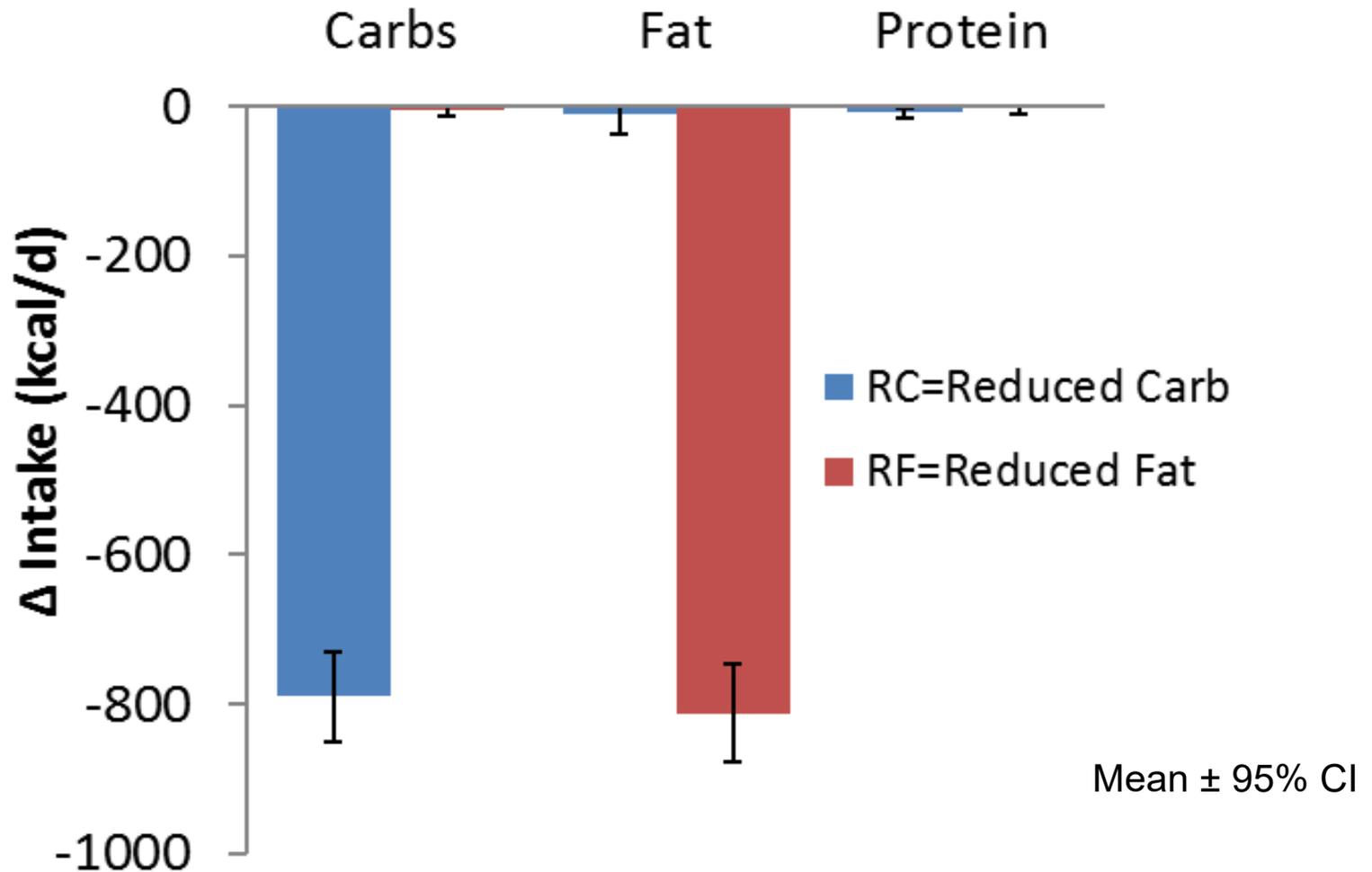
Fat Loss Requires Carbohydrate Reduction?

“Any diet that succeeds does so because the dieter restricts fattening carbohydrates... Those who lose fat on a diet do so because of what they are not eating – the fattening carbohydrates”

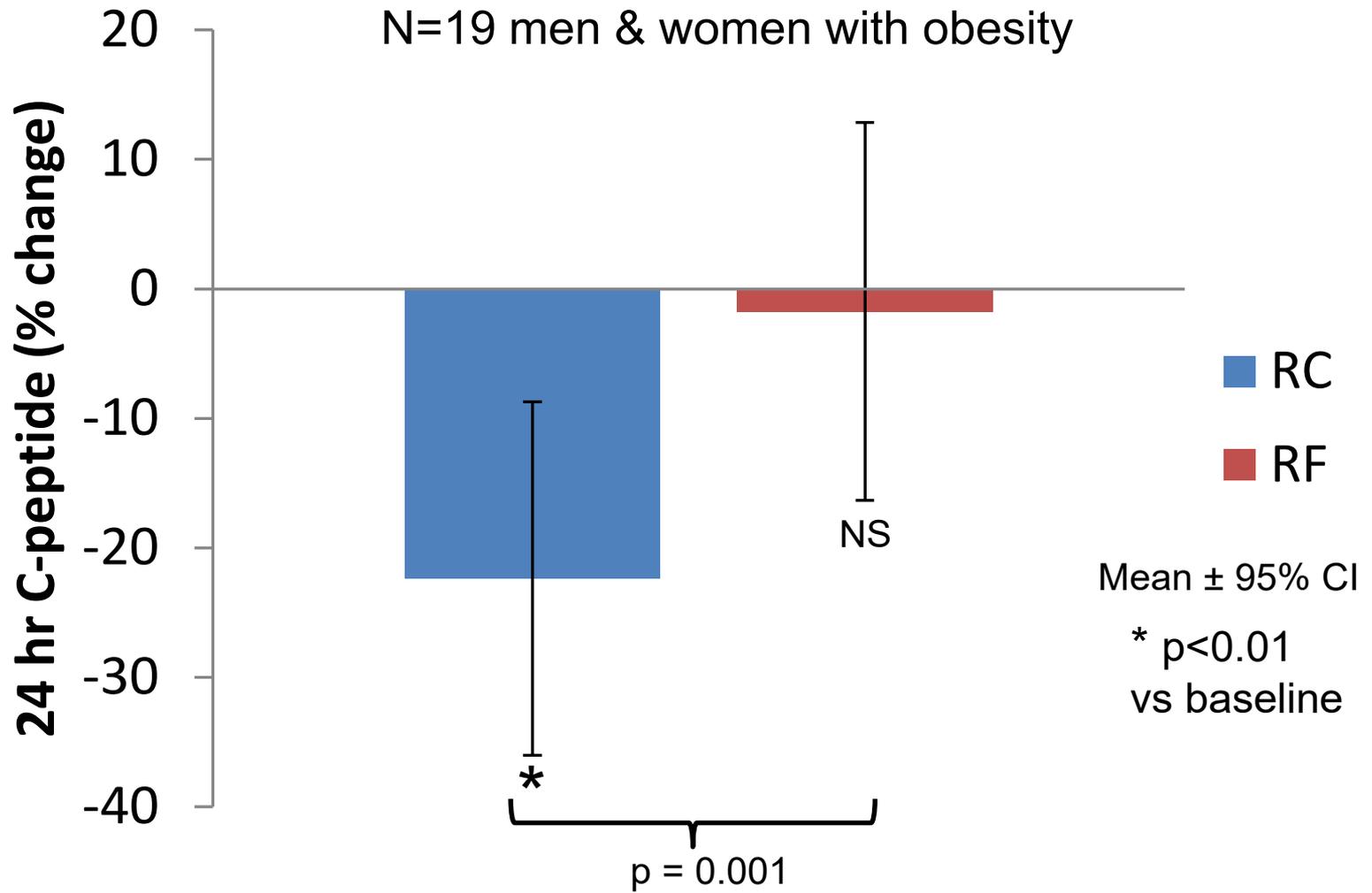


Gary Taubes, *Why we get fat and what to do about it* (2011).

Isocaloric 30% Calorie Restricted Diets

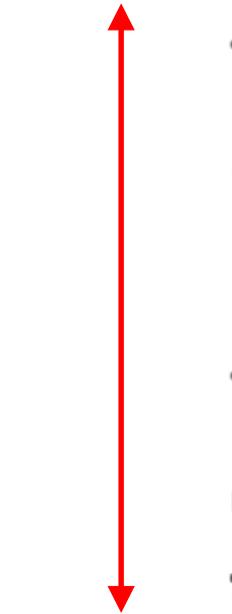


Only RC Diet Decreased Insulin Secretion

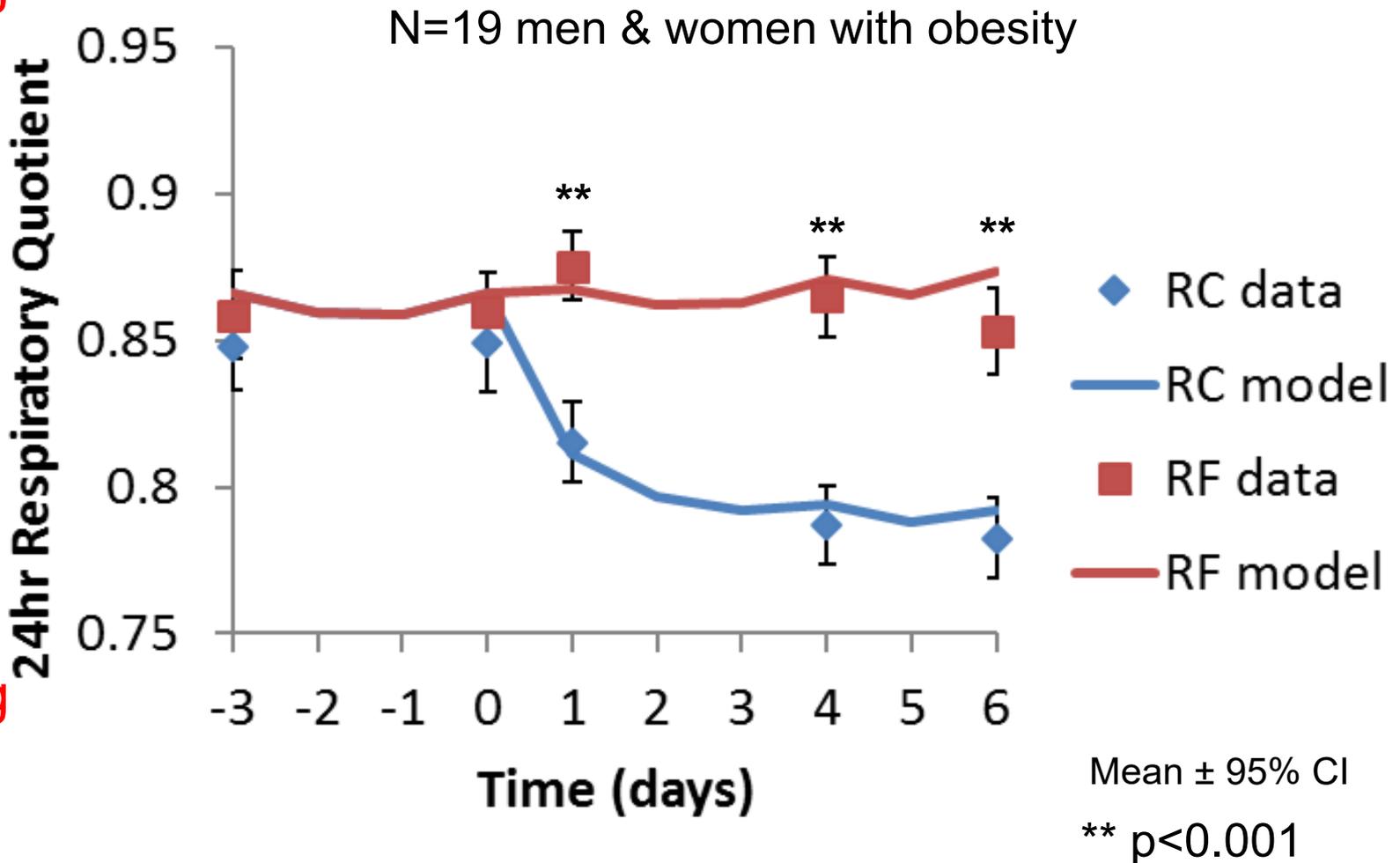


Only RC Diet Increased Fat Oxidation

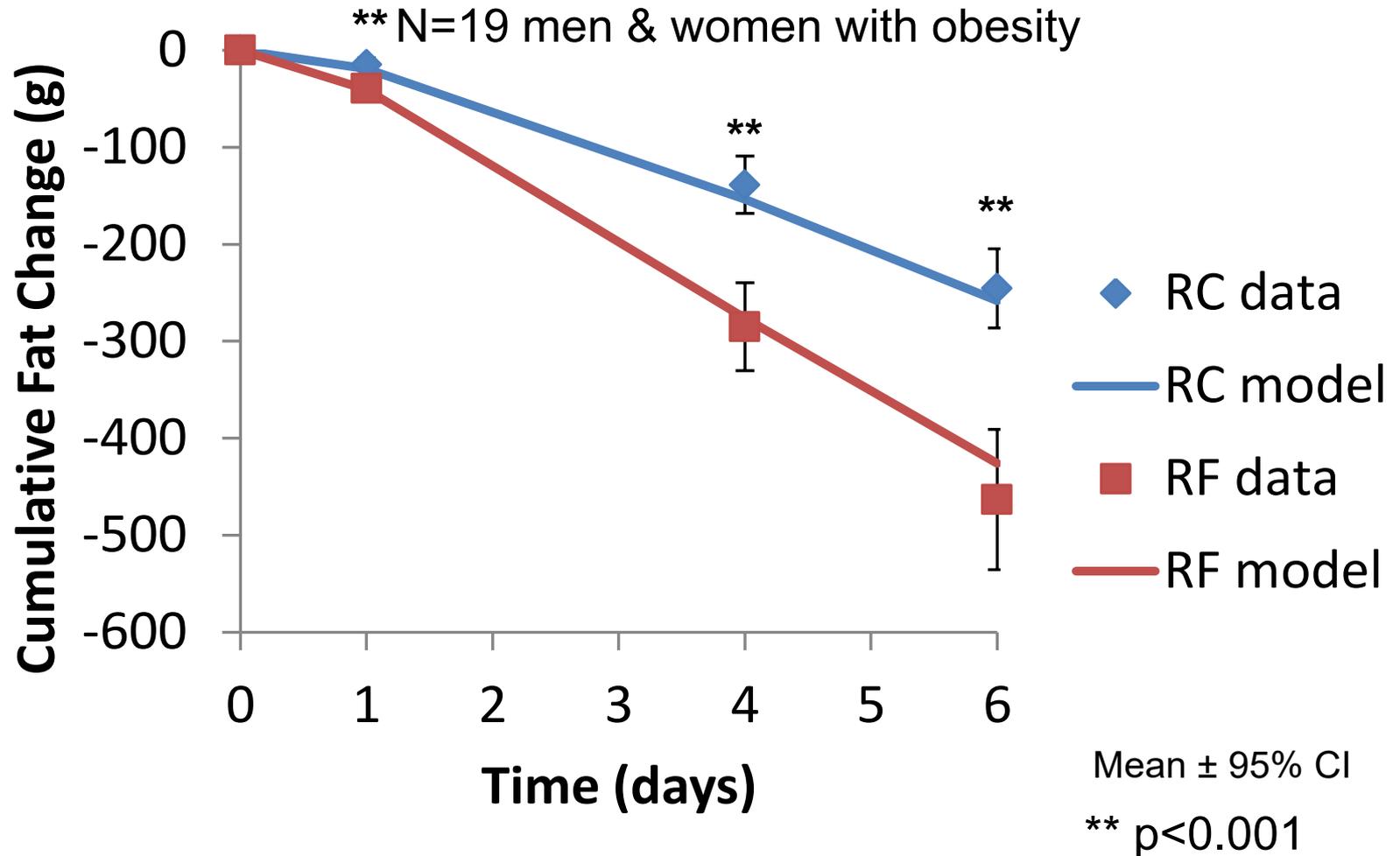
Burning
Carbs



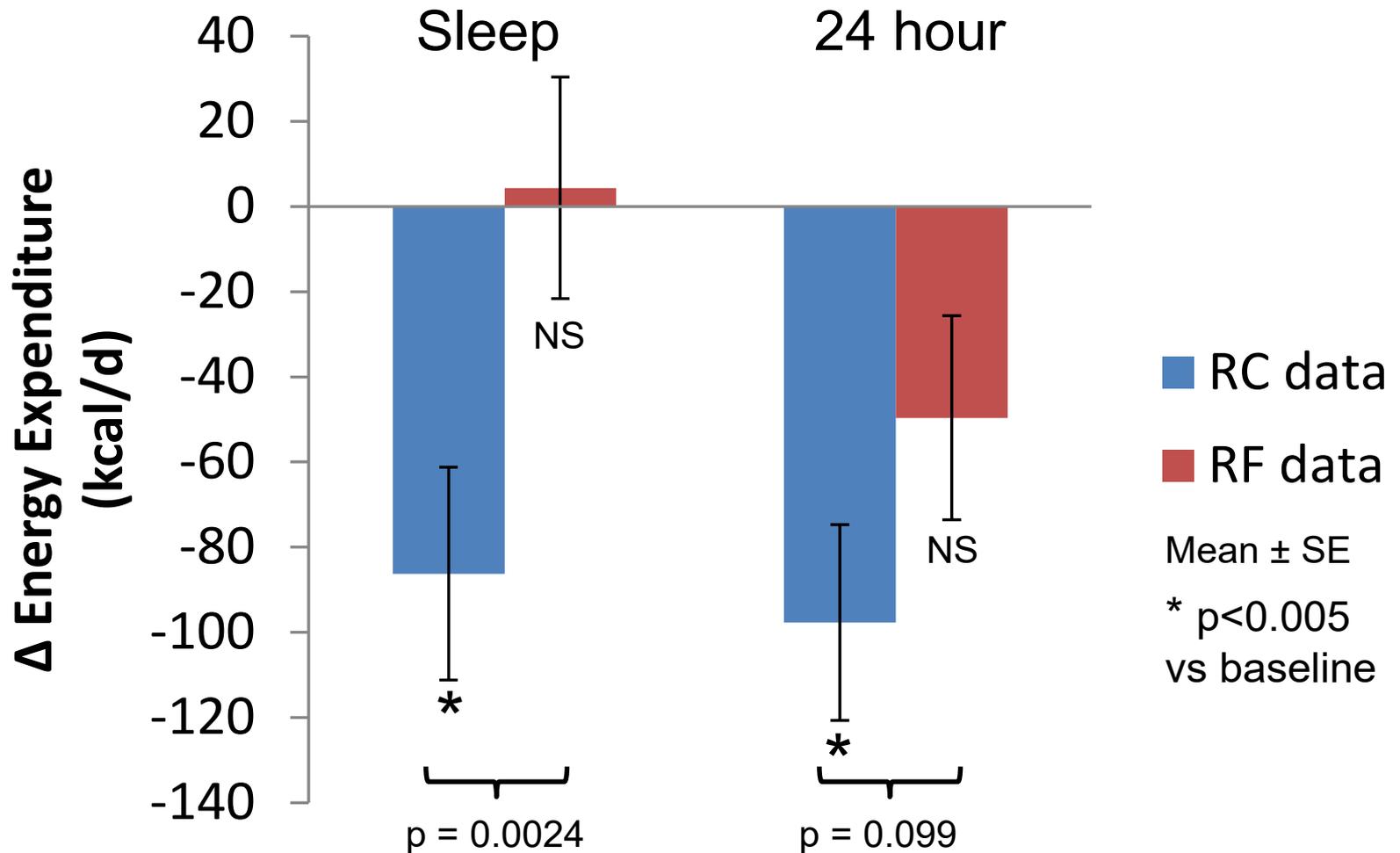
Burning
Fat



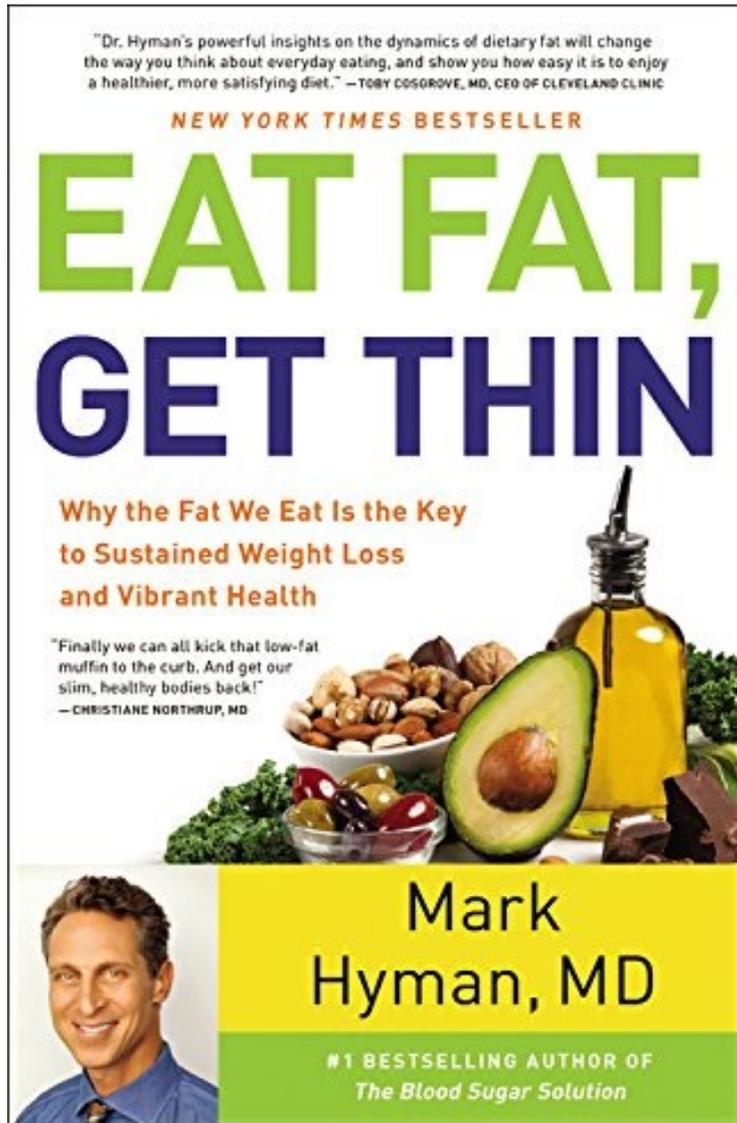
More Cumulative Body Fat Loss with RF



Only RC Decreases Energy Expenditure



The Low Carb Community Responds

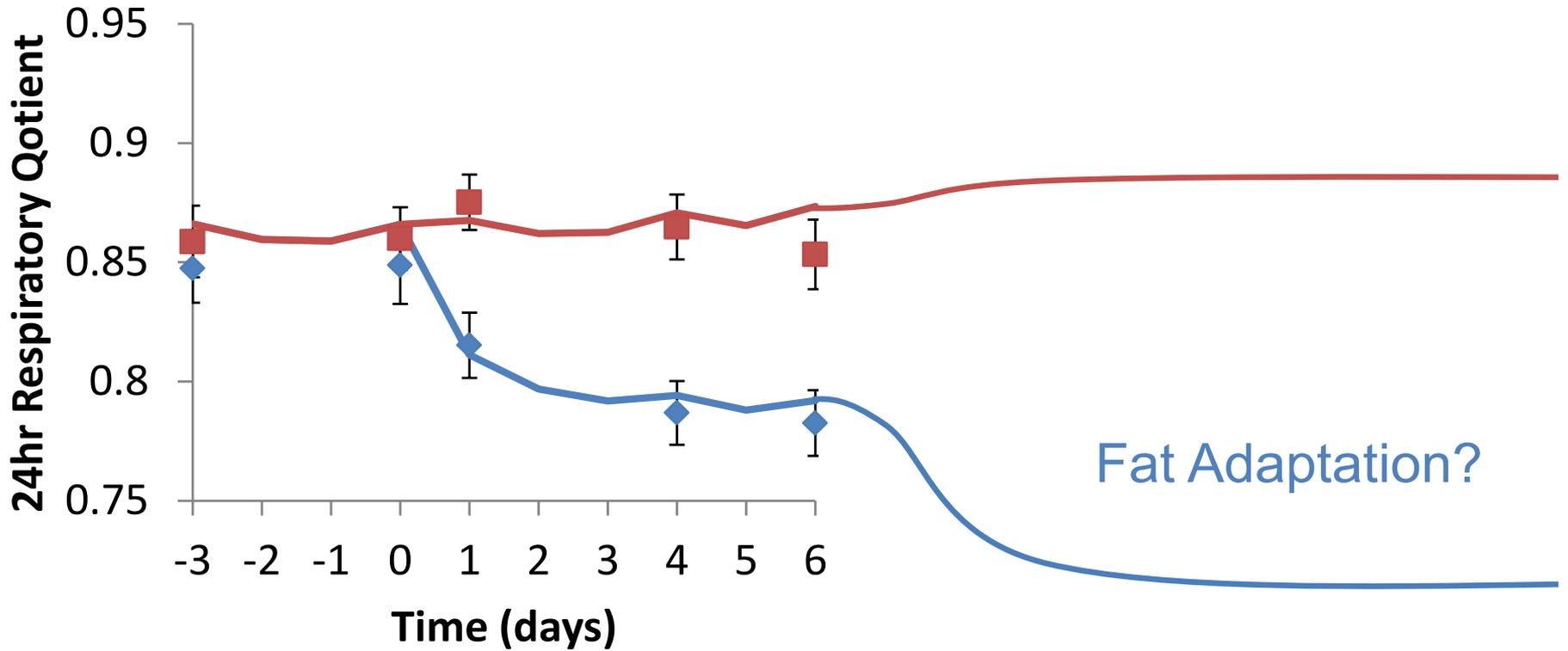


Recently, a study in *Cell Metabolism* by Kevin Hall from the National Institutes of Health attracted a lot of buzz in the news and online...[but] **there were some real problems with the study**

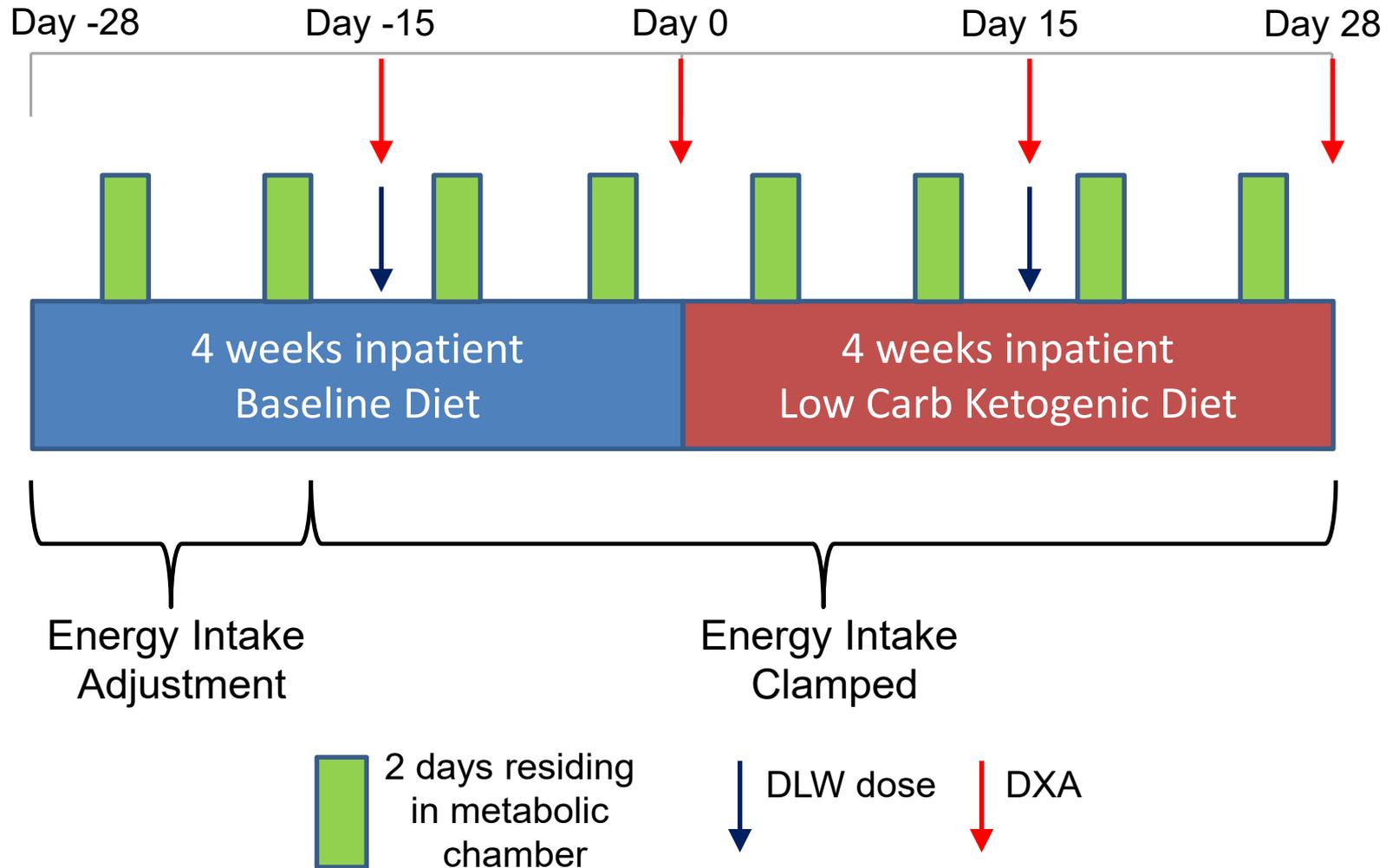
- The **low-carb diet wasn't low at all**, actually, with 29 percent of calories coming from carbs, including refined carbs. A true low-carb diet would have less than 10 percent of calories from carbs.
- It was a **very short-duration study (only six days)** conducted on only nineteen people who were contained in a metabolic ward where all the food was provided...It showed what happened in a vacuum but not in real life.

Mark Hyman, MD
Eat Fat, Get Thin (2016)

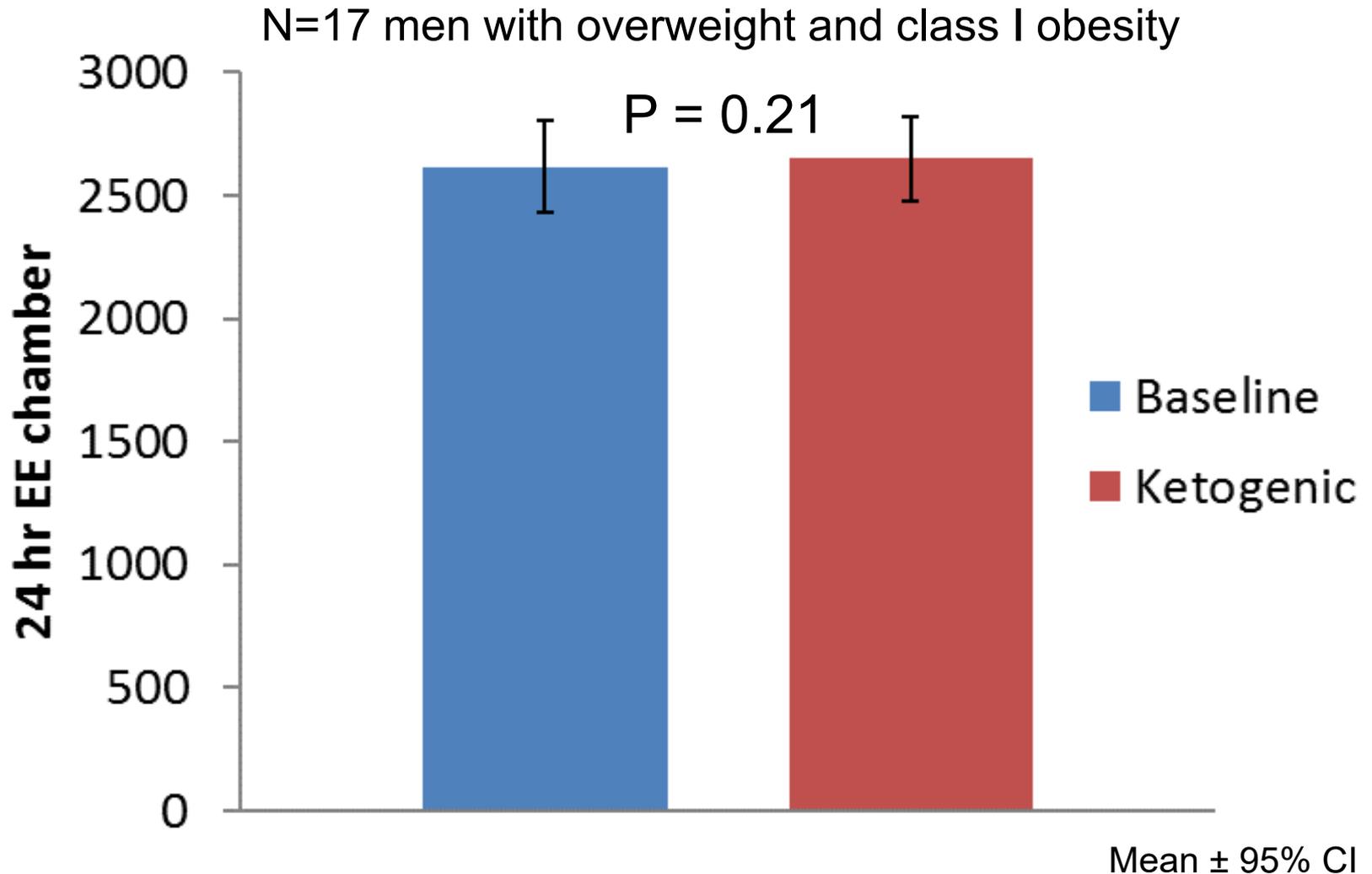
Hypothetical Extended Duration Study



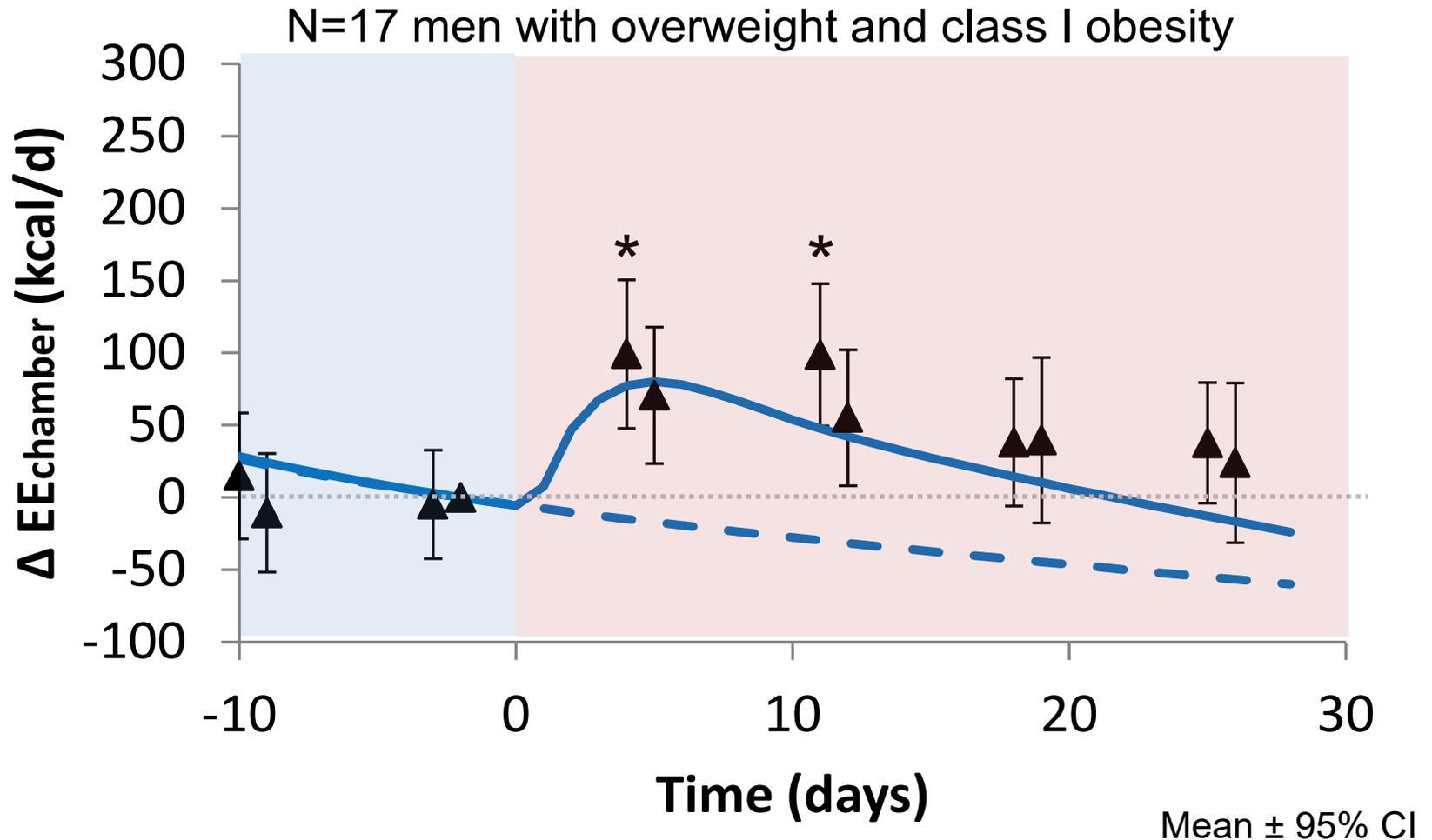
2 Month Isocaloric Ketogenic Diet Study



No Diet Effect on 24hr Energy Expenditure



Small & Transient Increase in Expenditure

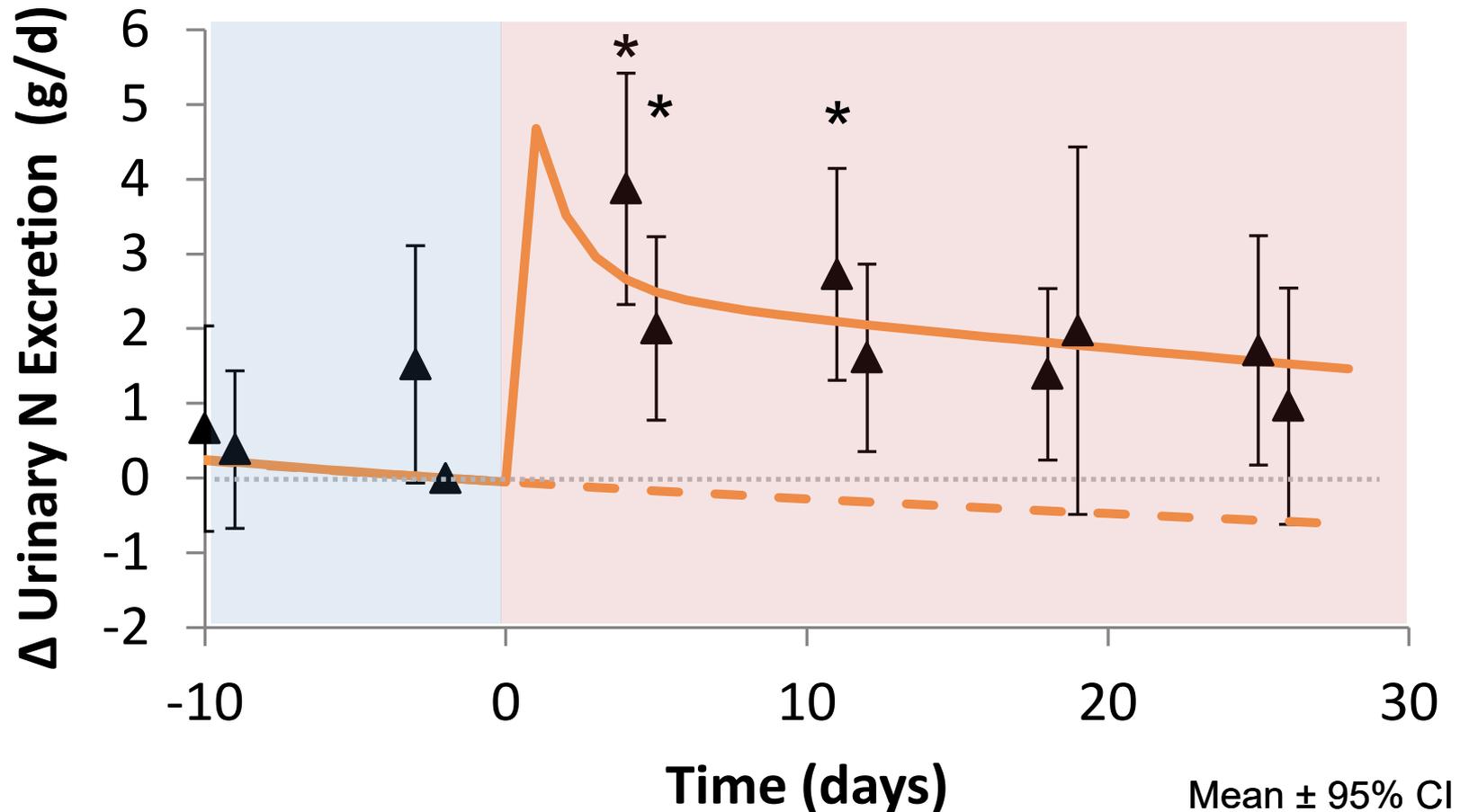


KD Hall et al. *AJCN* 104:324–33 (2016).

*
p<0.0045

Increased N Excretion post Ketogenic Diet

N=17 men with overweight and class I obesity

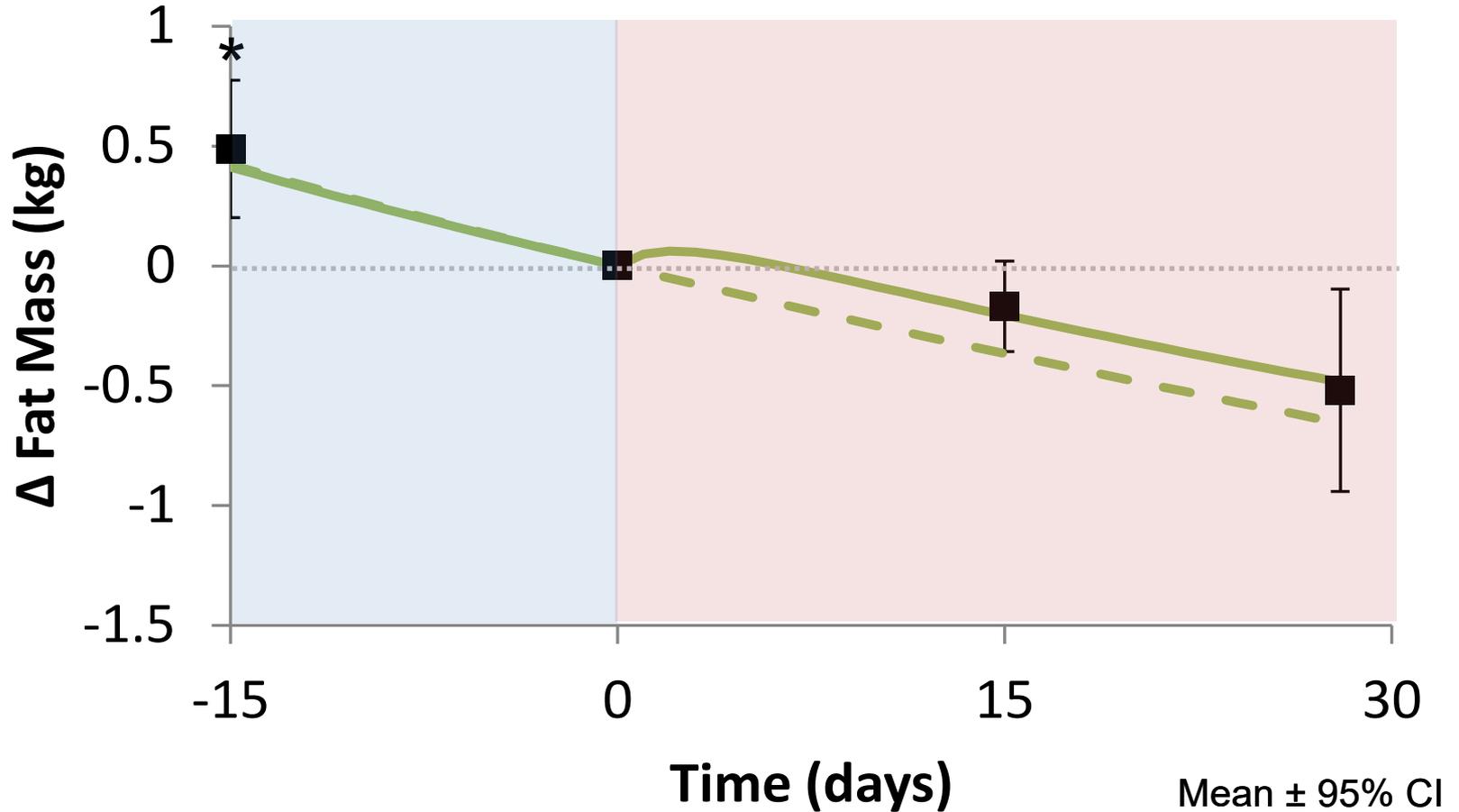


*
p<0.0045

KD Hall et al. *AJCN* 104:324–33 (2016).

Loss of Body Fat Slows post Ketogenic Diet

N=17 men with overweight and class I obesity



Mean ± 95% CI

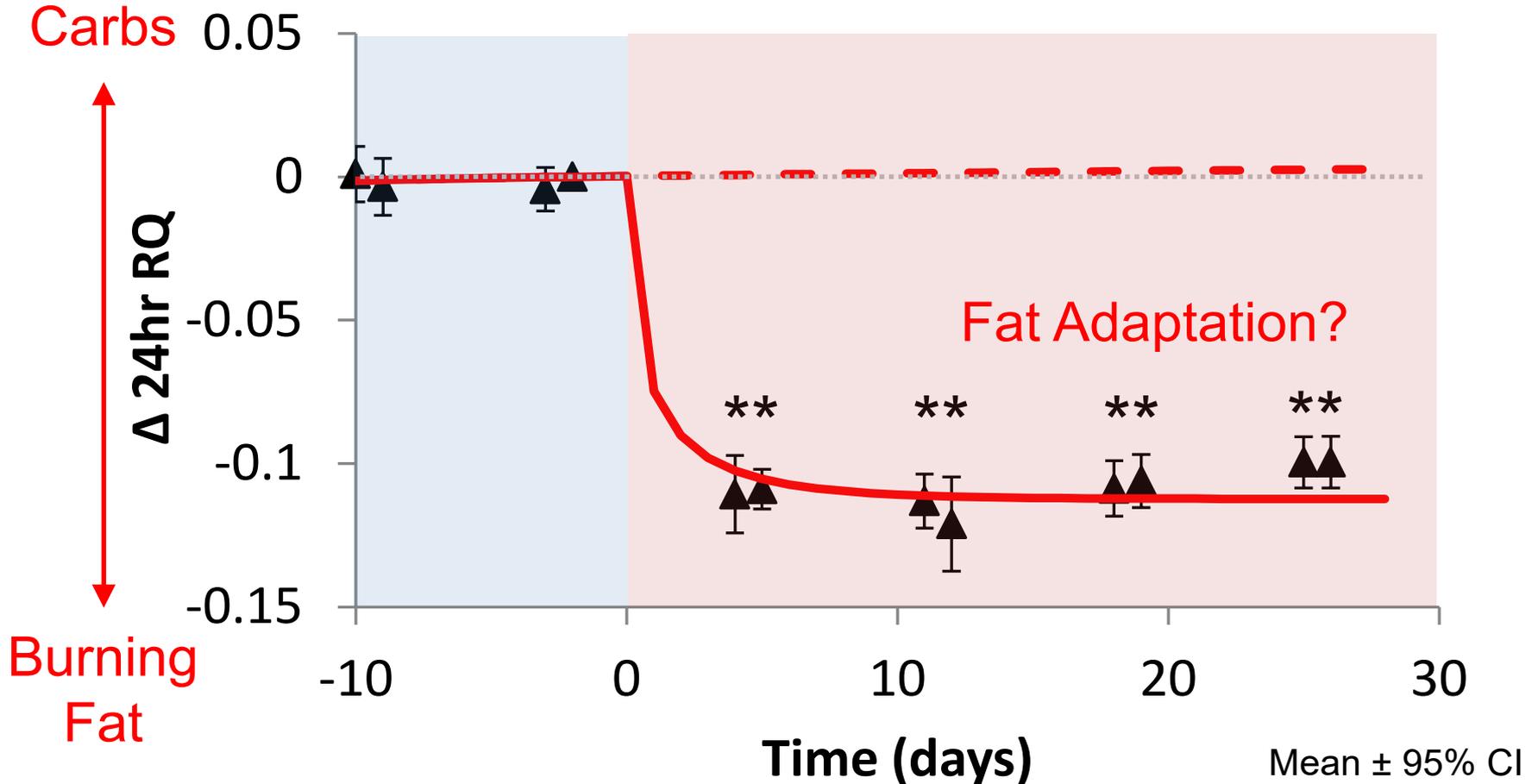
* p<0.0167

KD Hall et al. *AJCN* 104:324–33 (2016).

Rapid & Persistent Shift to Fat Oxidation

Burning
Carbs

N=17 men with overweight and class I obesity

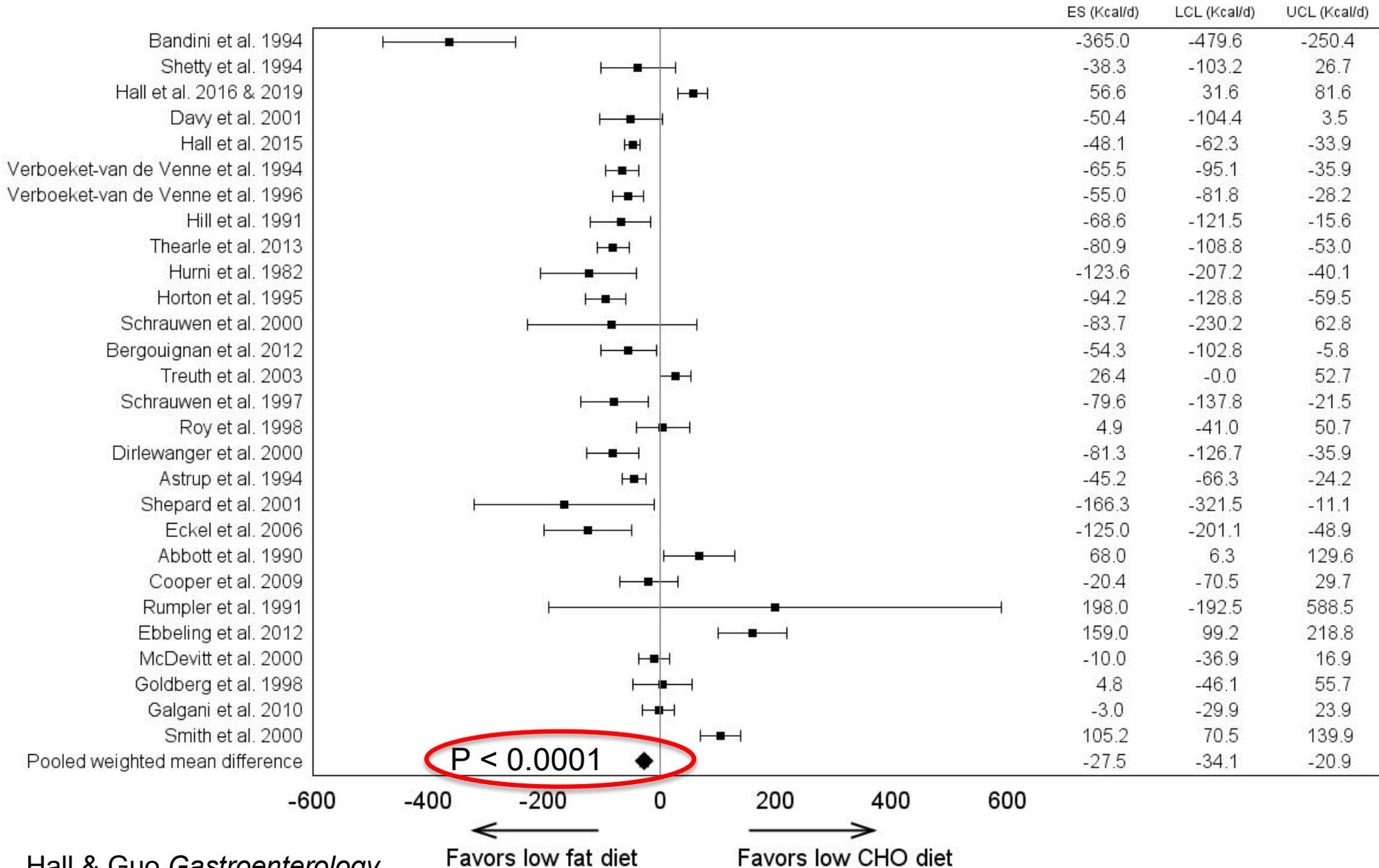


Burning
Fat

KD Hall et al. *AJCN* 104:324–33 (2016).

*
p<0.0045

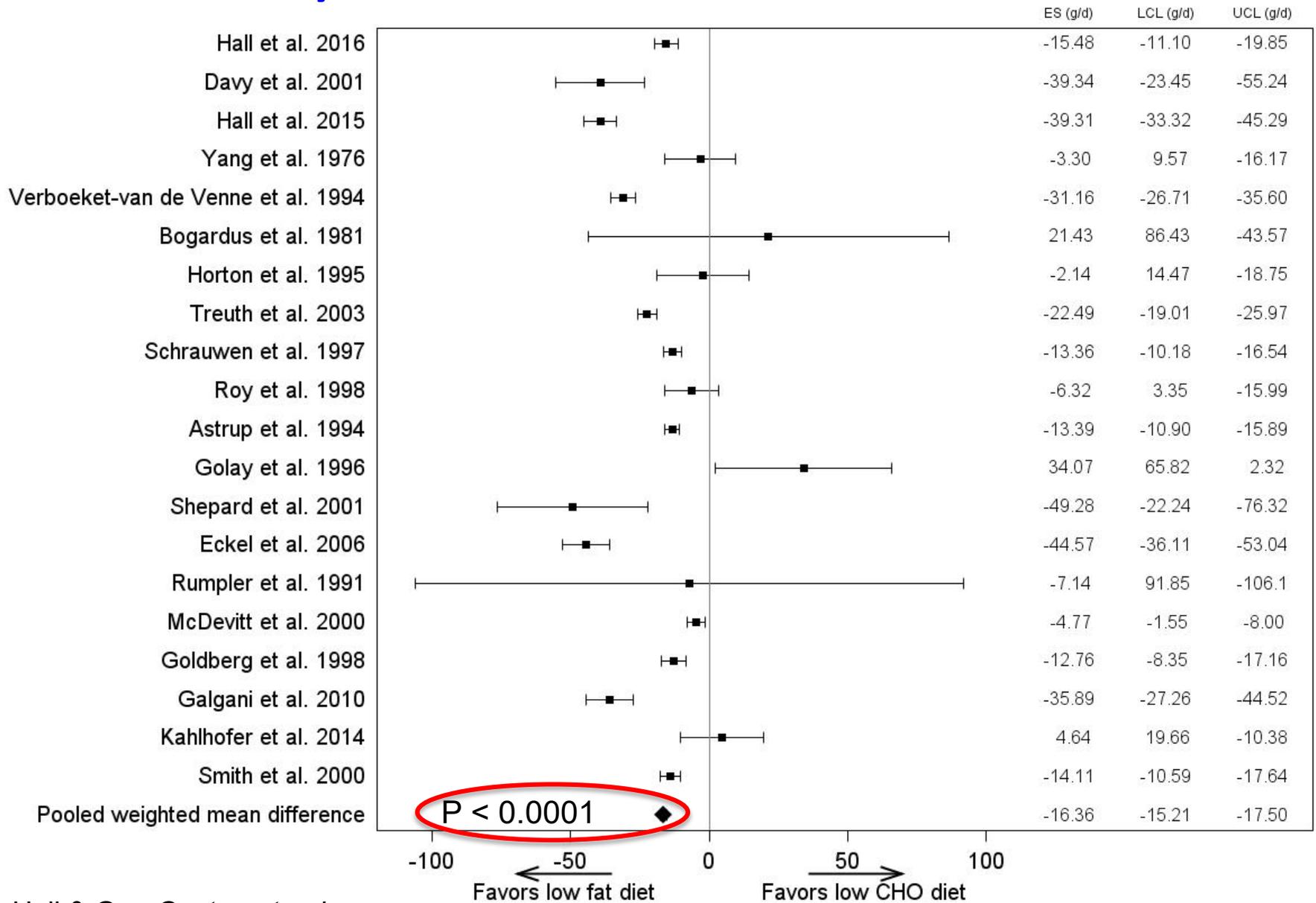
Energy Expenditure: Isocaloric Carb vs. Fat



Hall & Guo *Gastroenterology*
152:1718–27 (2017)

Weighted Mean Difference in Energy Expenditure (kcal/d)

Body Fat: Isocaloric Carb vs. Fat

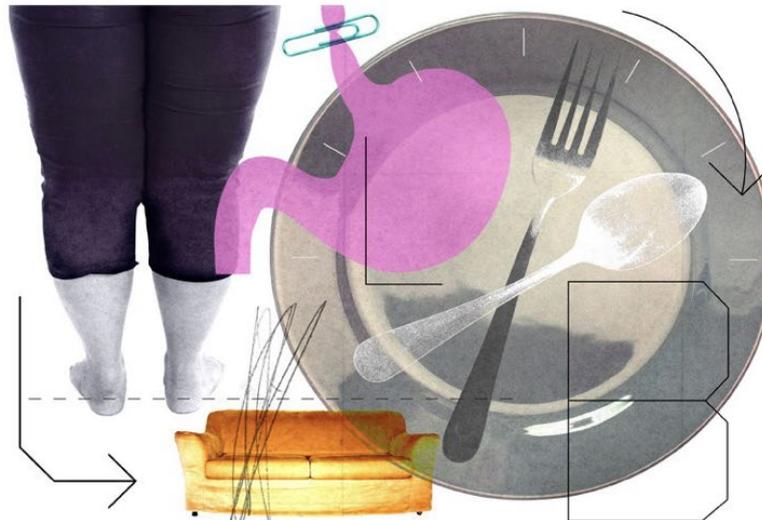




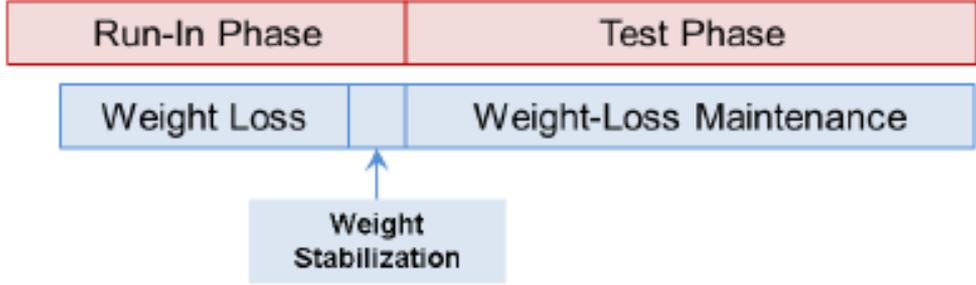
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How a Low-Carb Diet Might Help You Maintain a Healthy Weight

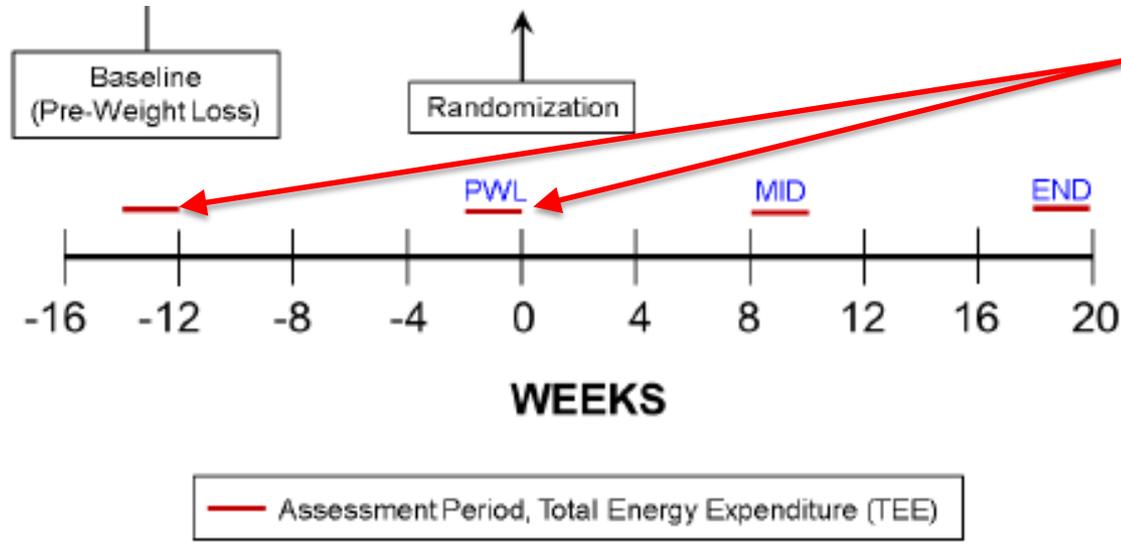
Adults who cut carbohydrates from their diets and replaced them with fat sharply increased their metabolisms.



Ebbeling et al. BMJ 2018 Study Design

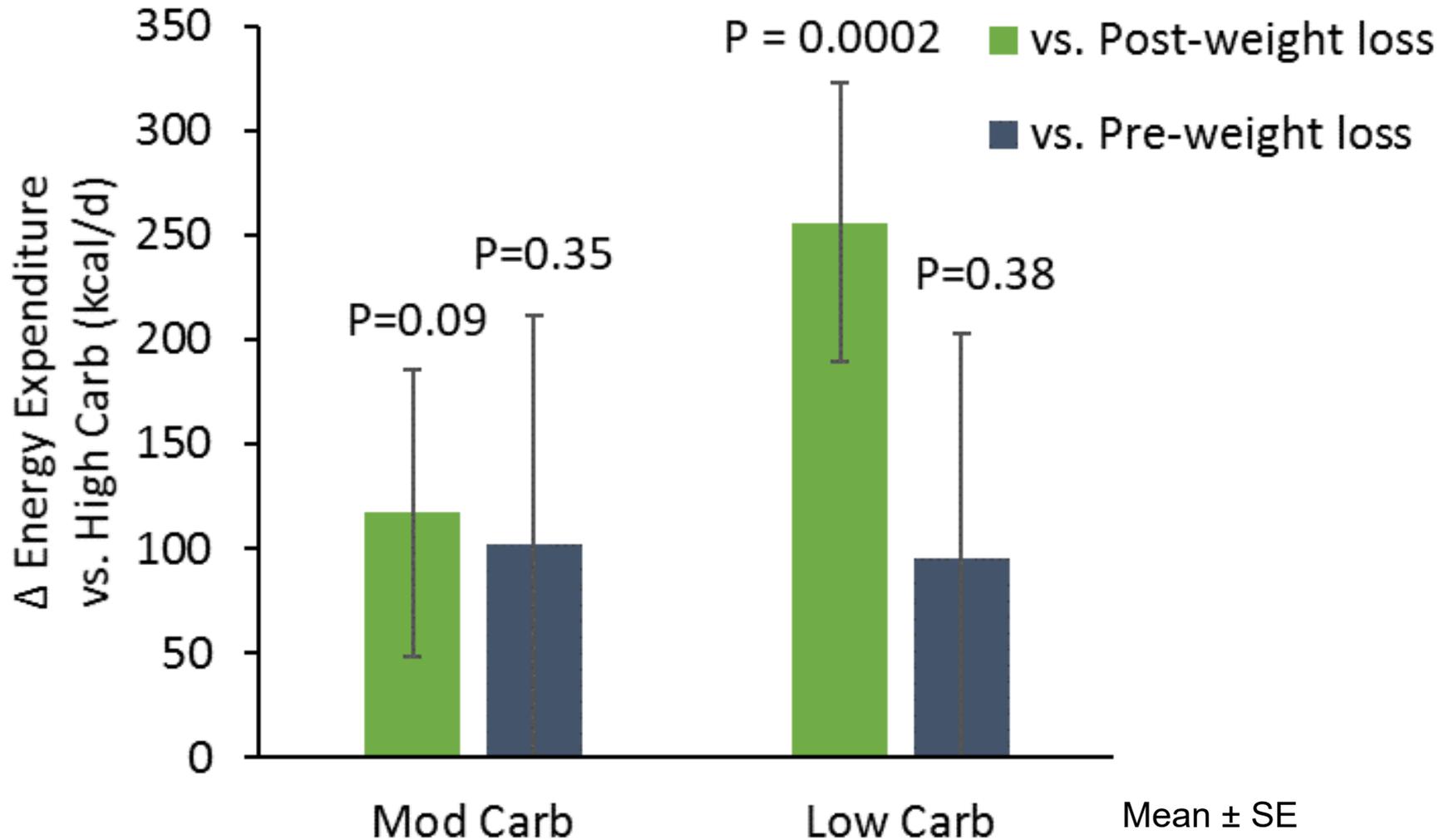


“The pre-weight-loss value..., rather than [post-weight-loss], was *originally specified in the registry* as the anchor for calculating change scores, but this error was corrected...”



Two potential points of comparison: Pre Weight Loss vs Post Weight Loss

Ebbeling et al. BMJ 2018 Reanalysis





Tweet



Dr. David Ludwig @davidludwi... · 22h ✓

Our recent study on metabolic advantage of low-carbohydrate diets has provoked a rapidly evolving series of attacks from a few critics. Our latest response is online [@bmj_latest](#).

👉 Bottom line: Do a weaker analysis, get a weaker result.

👉 No big surprise.

[bmj.com/content/363/bm...](#)



Samuele Marcora
@SamueleMarcora

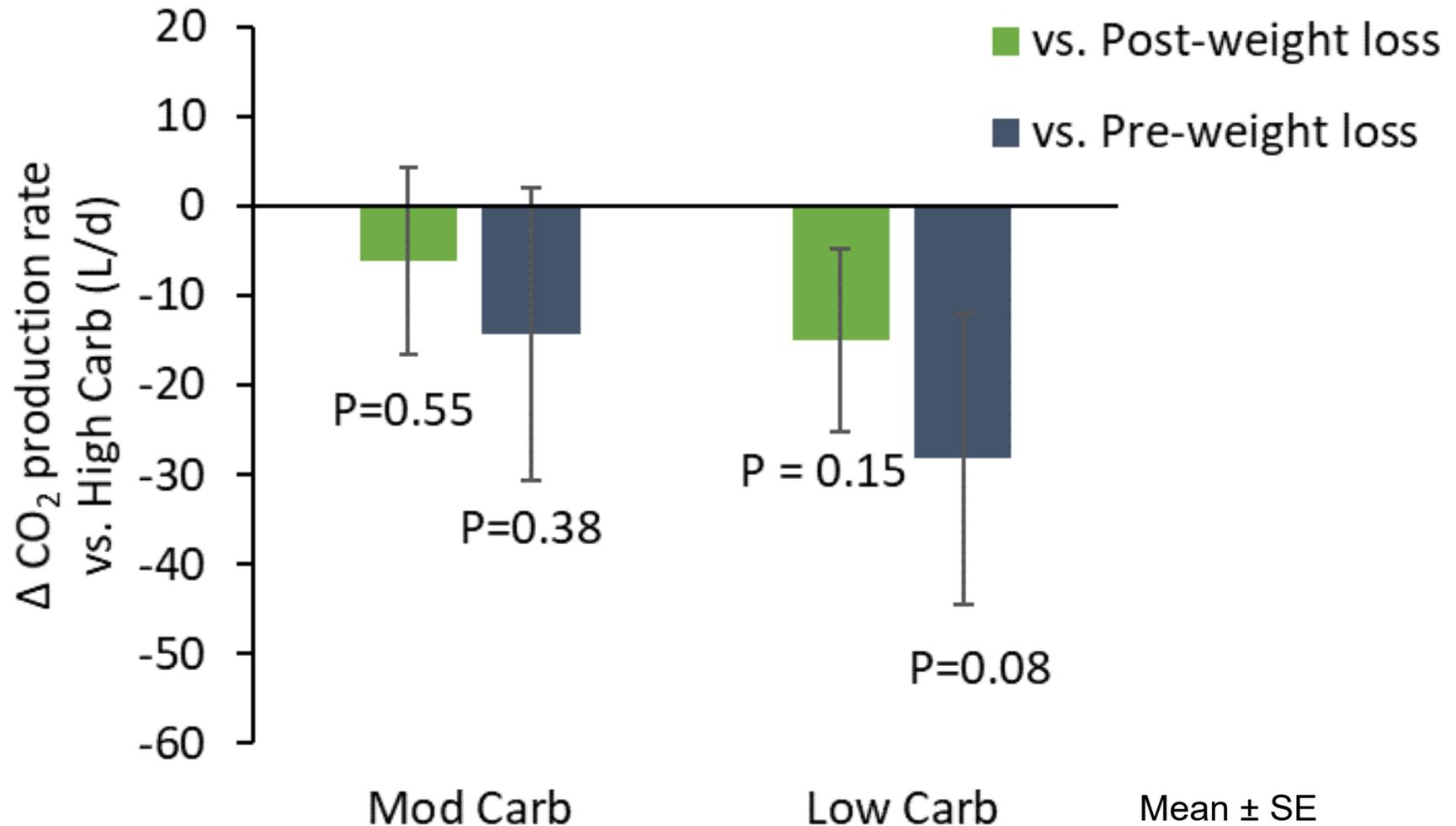


Replying to [@davidludwigmd](#) and [@bmj_latest](#)

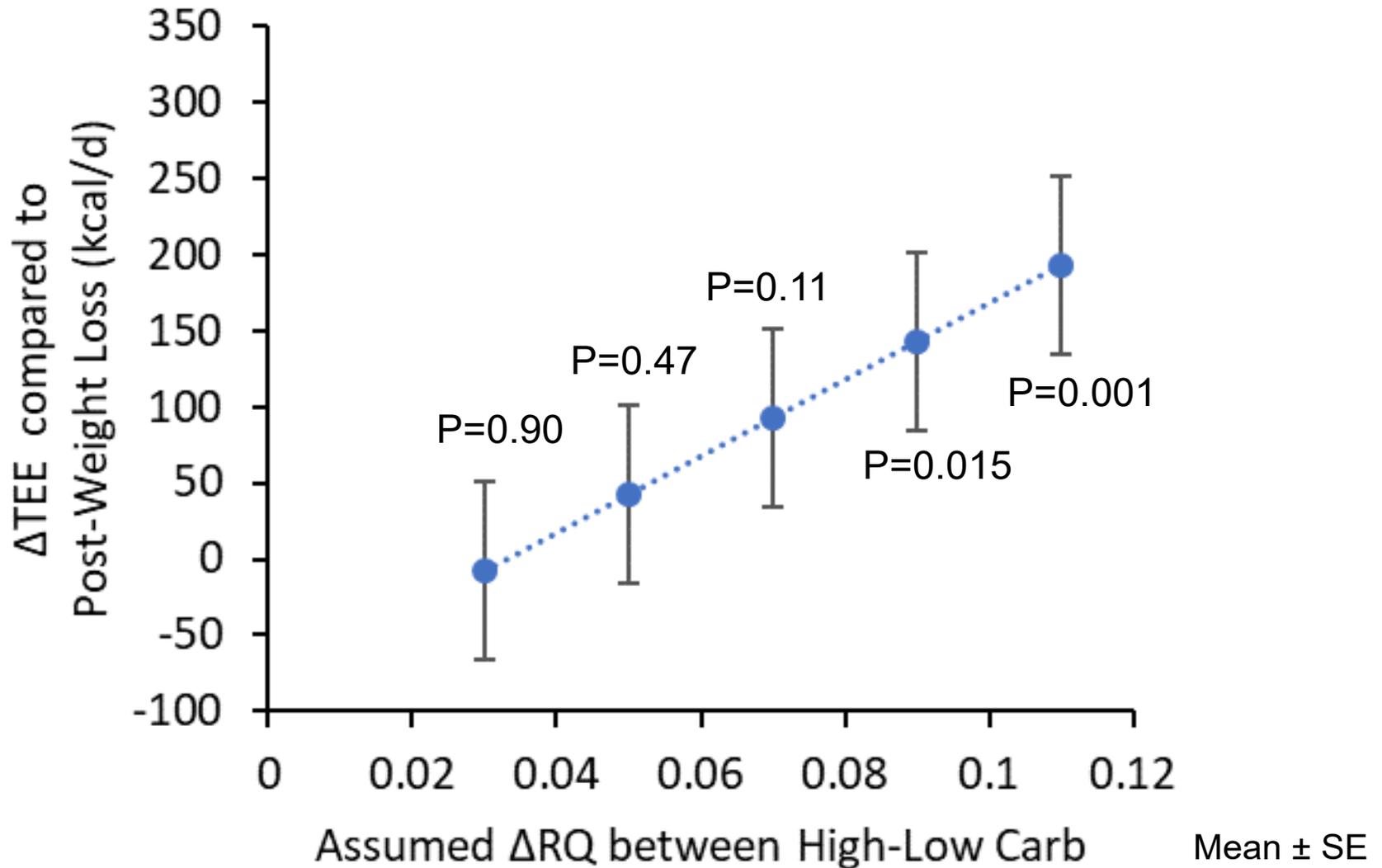
Why did you originally plan a weaker analysis then?

11/29/18, 5:00 PM

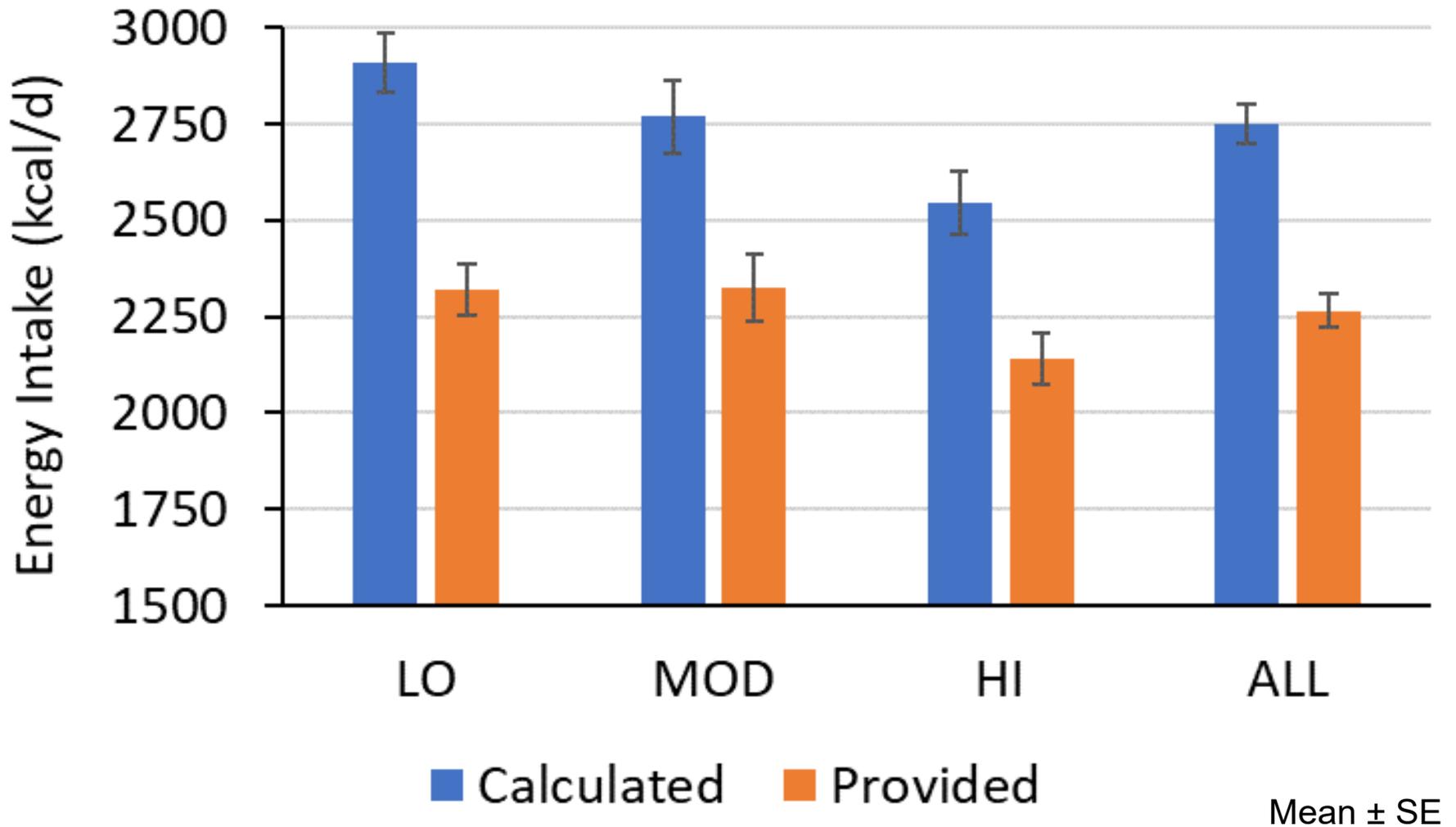
No Significant Diet Effect on CO₂ Production



TEE Diet Effect Depends on Assumed ΔRQ

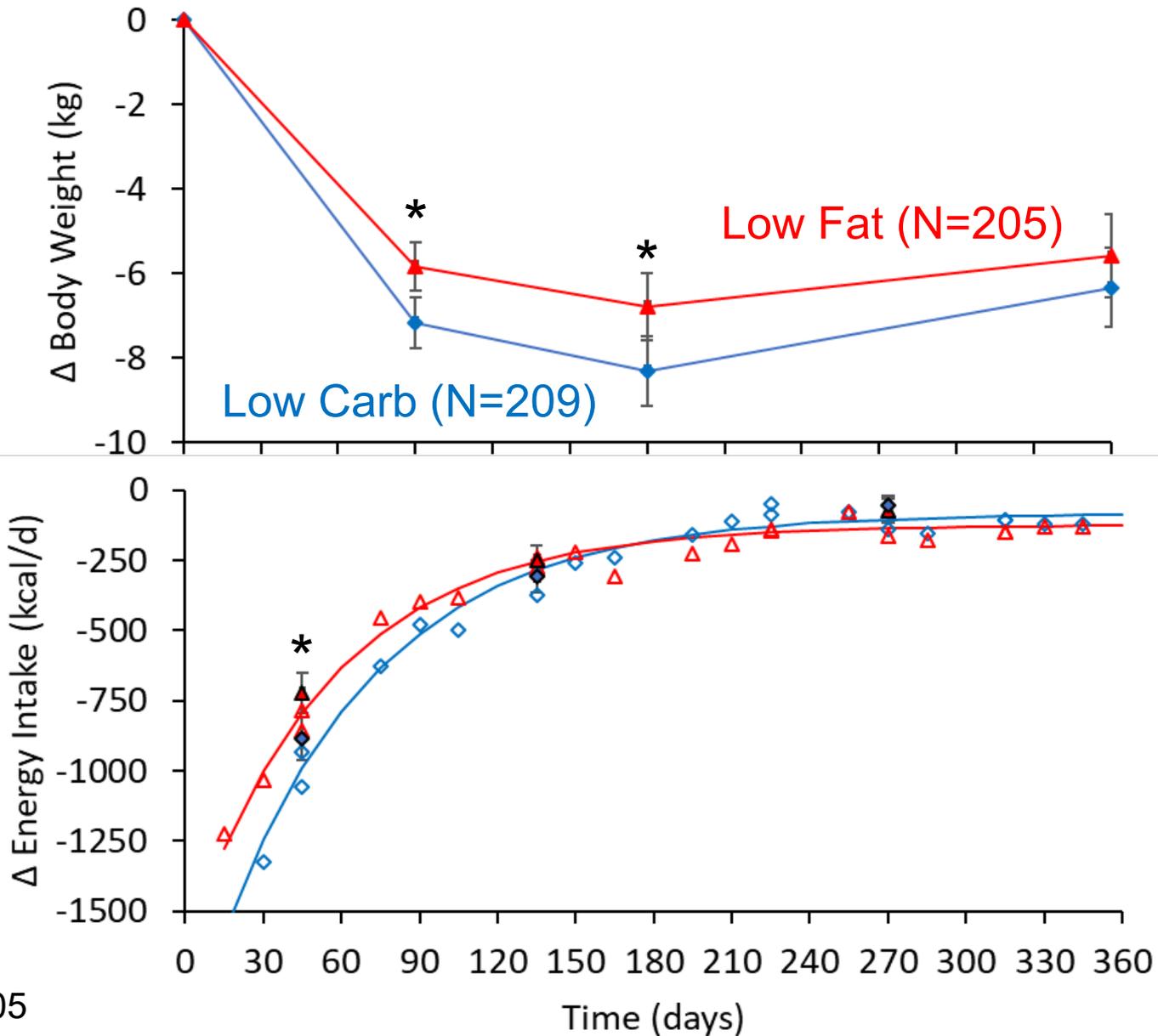


Unaccounted Calories \Rightarrow Uncertain RQ



Data from CB Ebbeling et al. *The BMJ* 363:k4583 (2018).

What About Energy Intake? DIETFITS Trial



* $p < 0.05$

The Key to Weight Loss Is Diet Quality, Not Quantity, a New Study Finds



Nutrition Facts
about 7 servings per container
Serving size, 5 crackers (16g)

Amount per serving	% Daily Value*
Calories	
Total Fat 1.5g	3%
Saturated Fat 0g	0%
Trans Fat 0g	0%
Cholesterol 0mg	0%
Sodium 135mg	6%
Total Carbohydrate 12g	4%
Dietary Fiber 0g	0%
Total Sugars 0g	0%
Includes 0g Added Sugars	0%
Protein 1g	2%
Vitamin D 0mcg	0%

A O'Connor *New York Times*
February 20, 2018

Can We Transcend the Diet Wars?

Low Carb

Low Fat



Common Theme: Avoid Ultra-processed Food



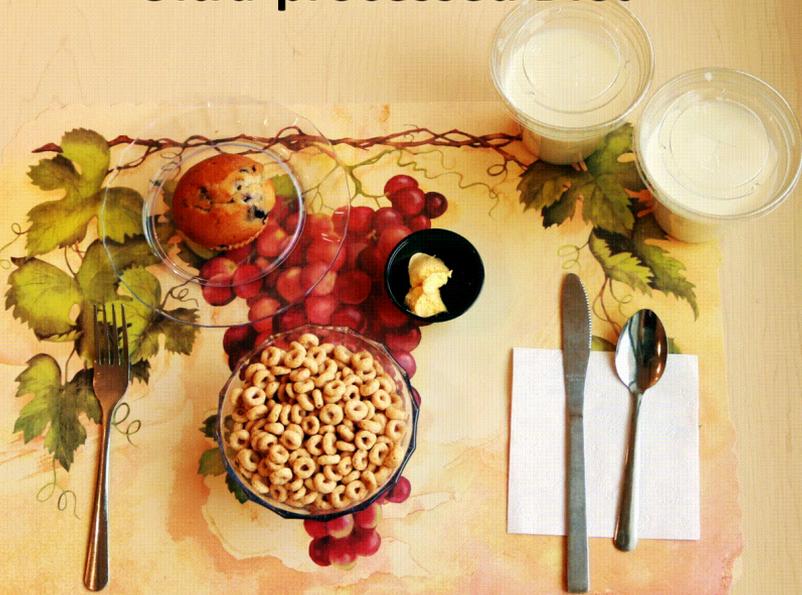
Unprocessed or minimally processed foods include fresh, dried, or frozen vegetables, grains, legumes, fruits, meats, fish, eggs, and milk. They are the basis of healthy dishes and meals.



Ultra-processed foods include fast food, sugary drinks, snacks, chips, candies, cookies, sweetened milk products, sweetened cereals, and sauce and dressings. They are nutritionally poor.

Ultra-processed vs Unprocessed Diets

Ultra-processed Diet



Unprocessed Diet



The meals had the same amount of:
Calories, Carbs, Fat, Protein, Sugar, Sodium, Fiber

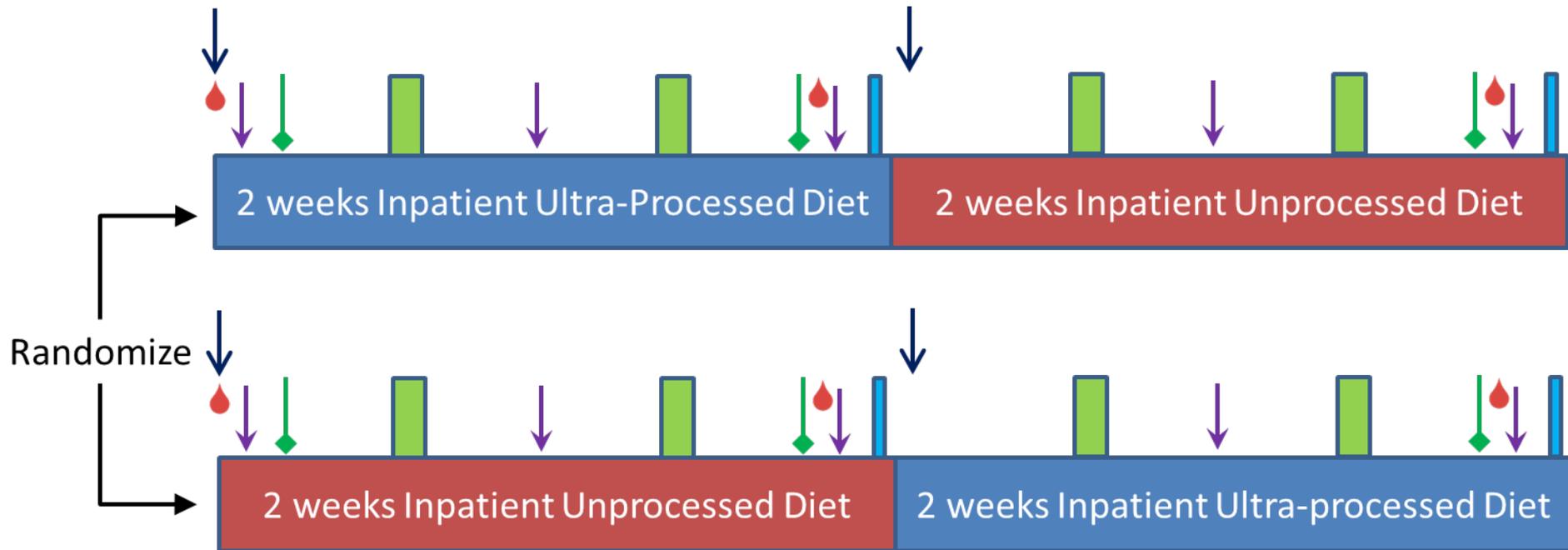
20 Adults were instructed to eat as much or as little as desired

Primary Outcome: Energy Intake Differences

KD Hall et al. *Cell Metabolism* In press (2019).

<https://osf.io/preprints/nutrixiv/w3zh2>

Ultra-processed vs Unprocessed Diet Study

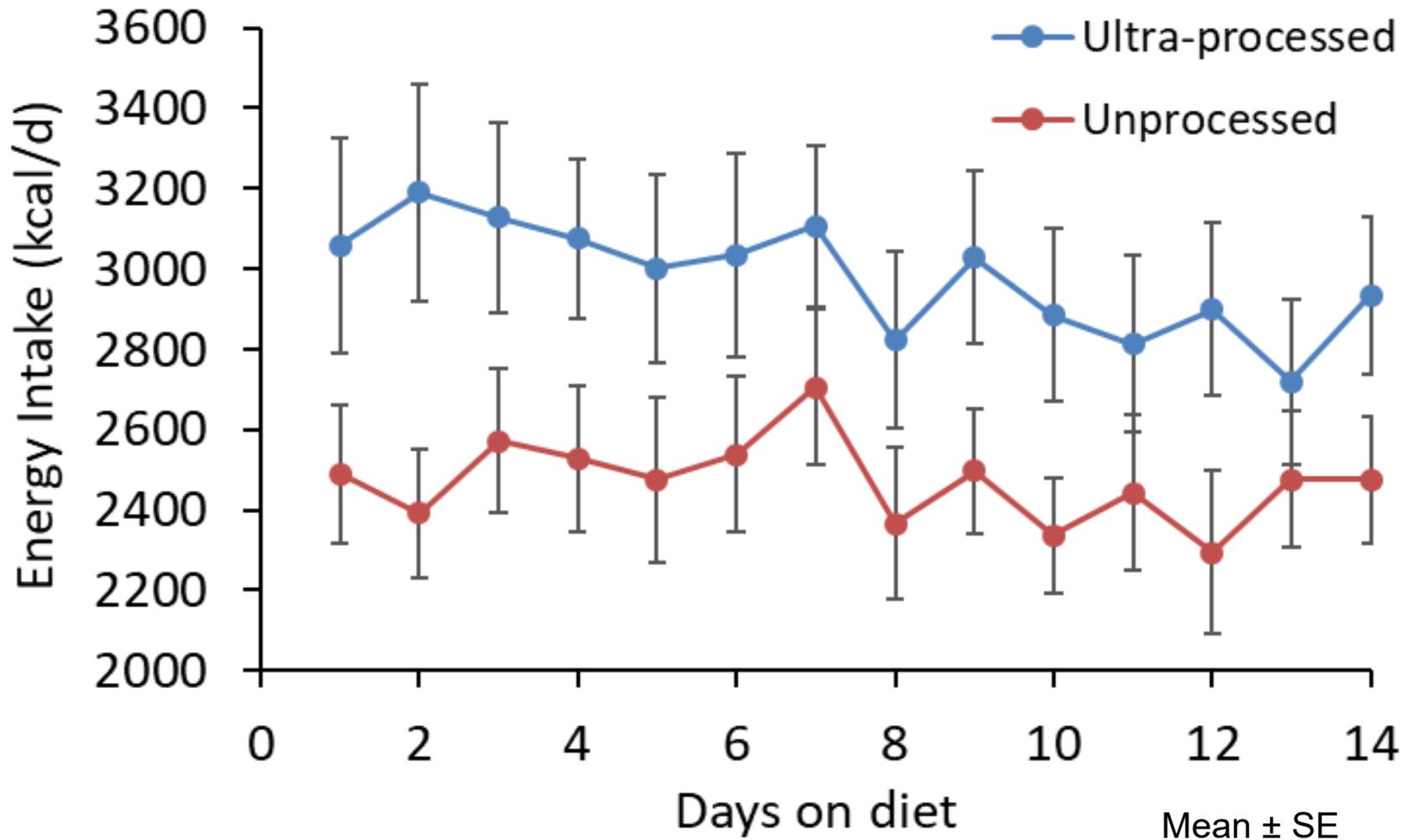


↓ DLW ● Fasted Blood ↓ DXA ↓ MRI MRS █ 24hr Chamber █ OGTT

KD Hall et al. *Cell Metabolism* In press (2019).

<https://osf.io/preprints/nutrixiv/w3zh2>

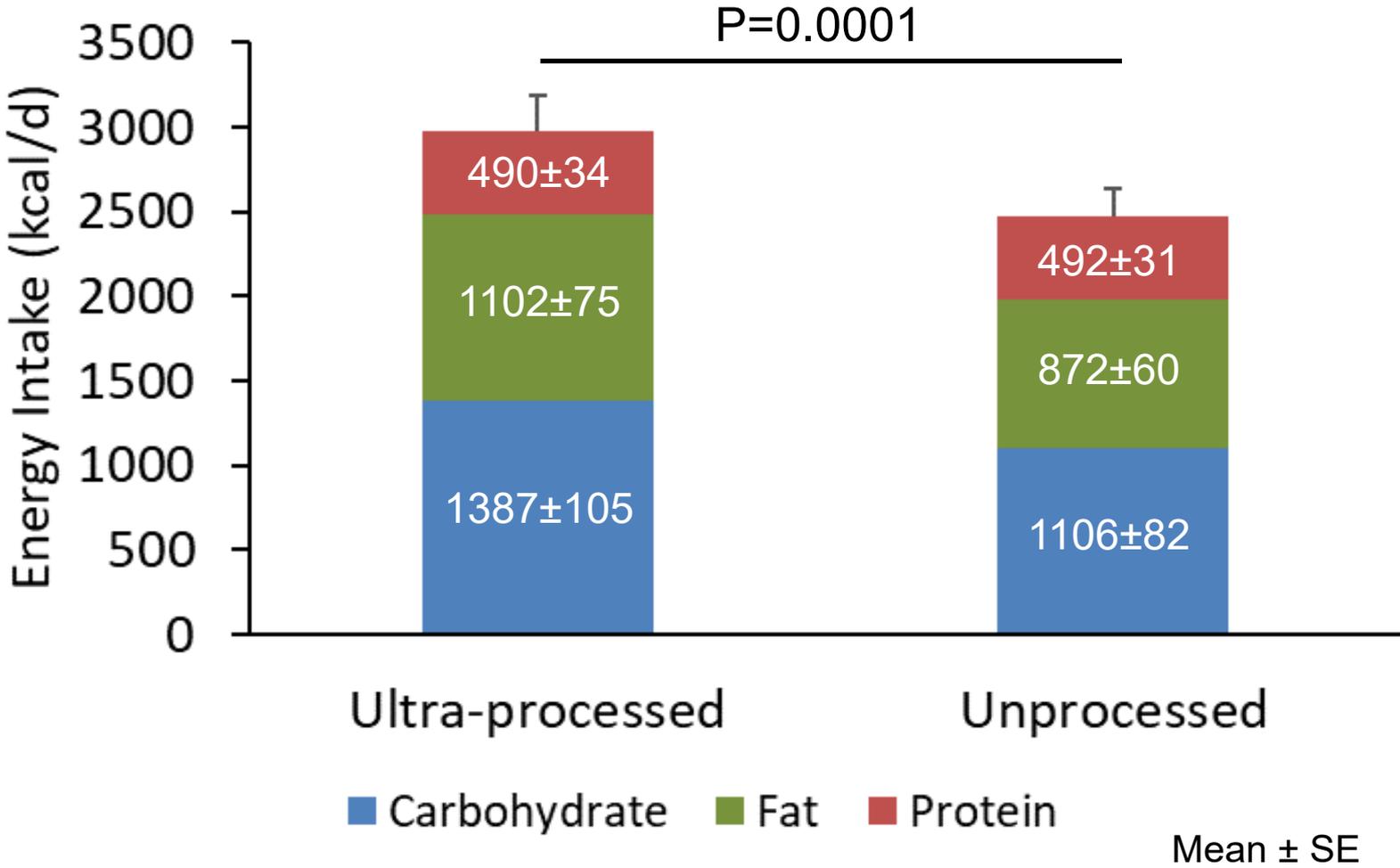
Ultra-processed Diets Cause Increased Intake



KD Hall et al. *Cell Metabolism* In press (2019).

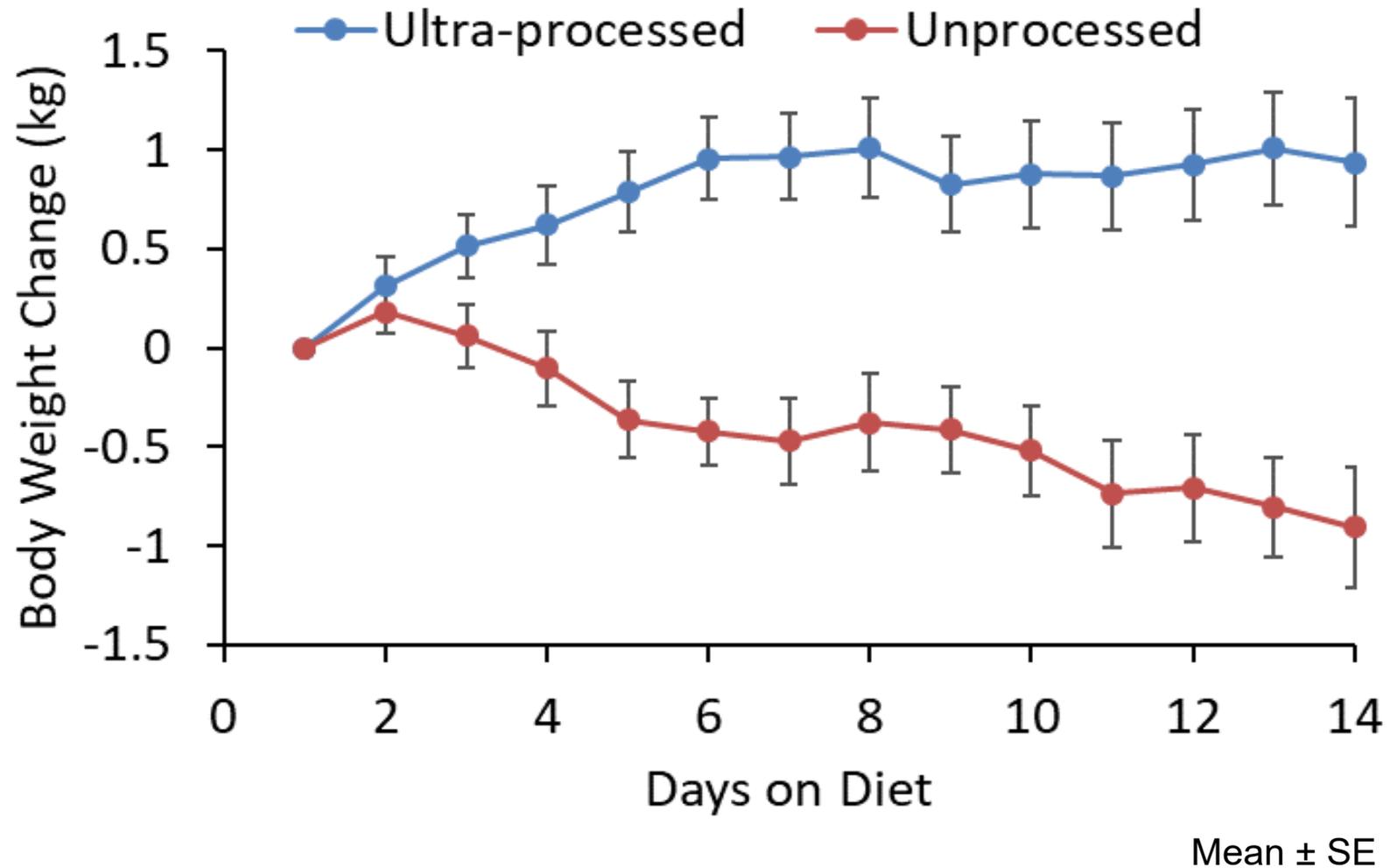
<https://osf.io/preprints/nutrixiv/w3zh2>

More Carbs & Fat with Ultra-processed Diets



KD Hall et al. *Cell Metabolism* In press (2019).
<https://osf.io/preprints/nutrixiv/w3zh2>

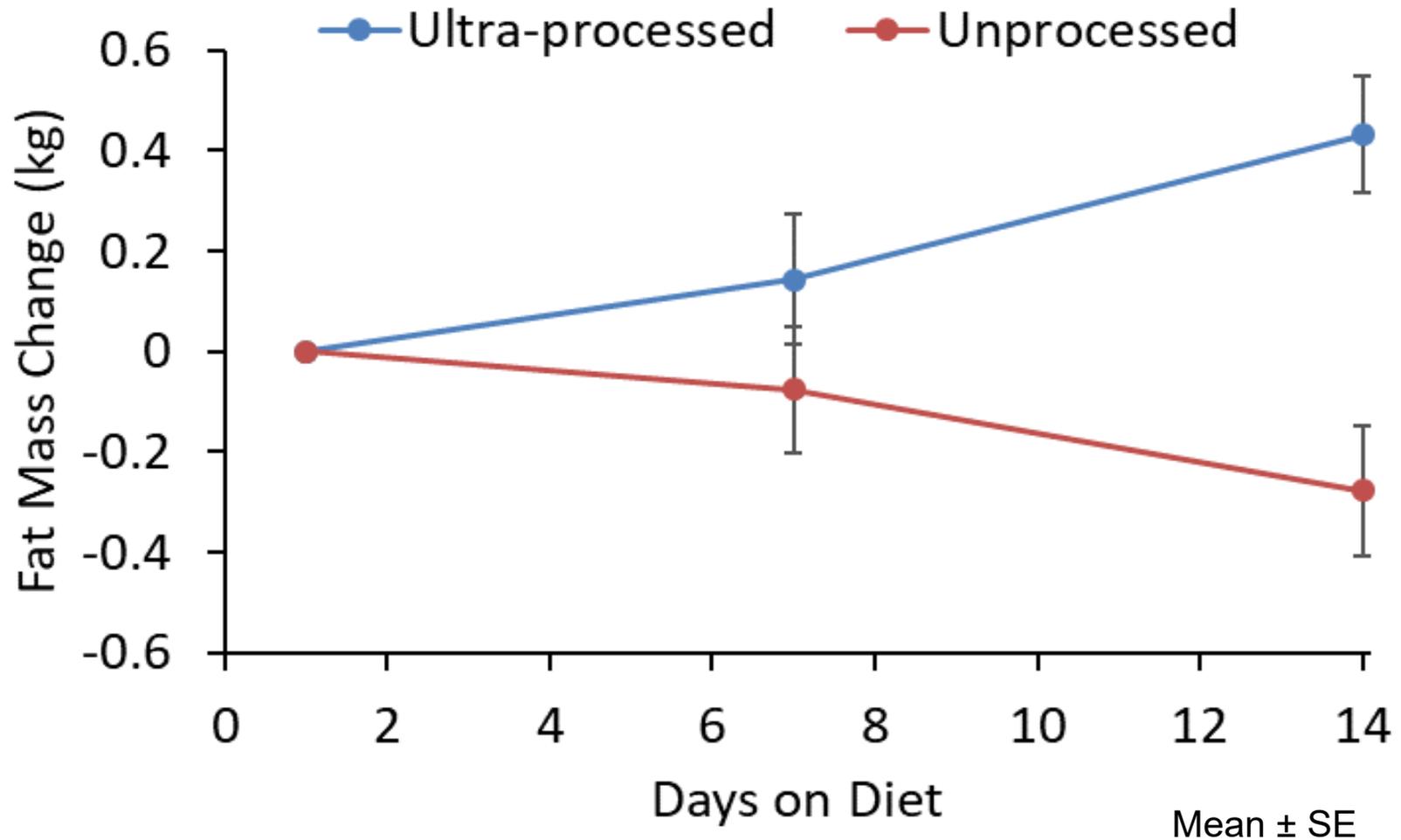
Ultra-processed Diets Cause Weight Gain



KD Hall et al. *Cell Metabolism* In press (2019).

<https://osf.io/preprints/nutrixiv/w3zh2>

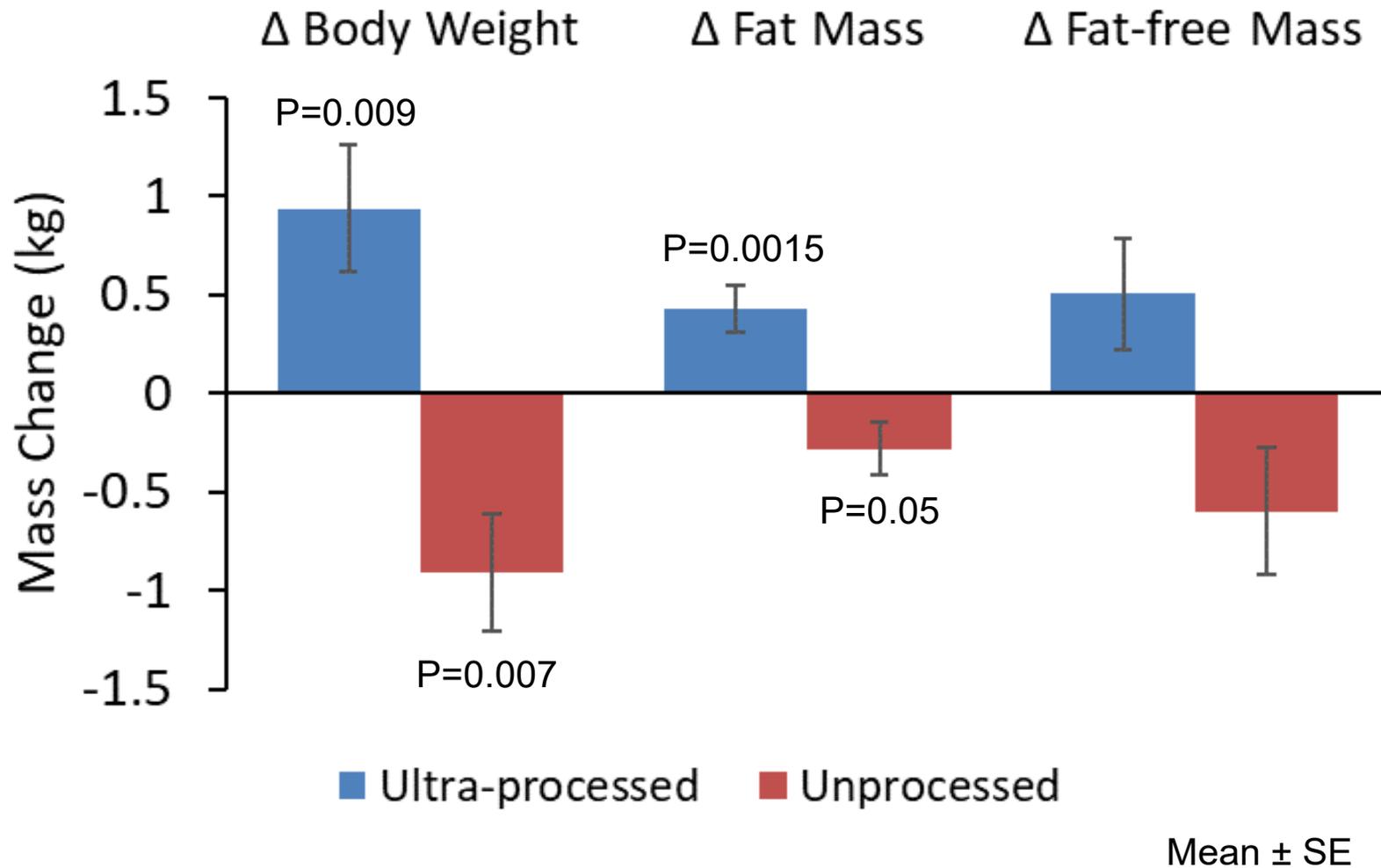
Ultra-processed Diets Cause Fat Gain



KD Hall et al. *Cell Metabolism* In press (2019).

<https://osf.io/preprints/nutrixiv/w3zh2>

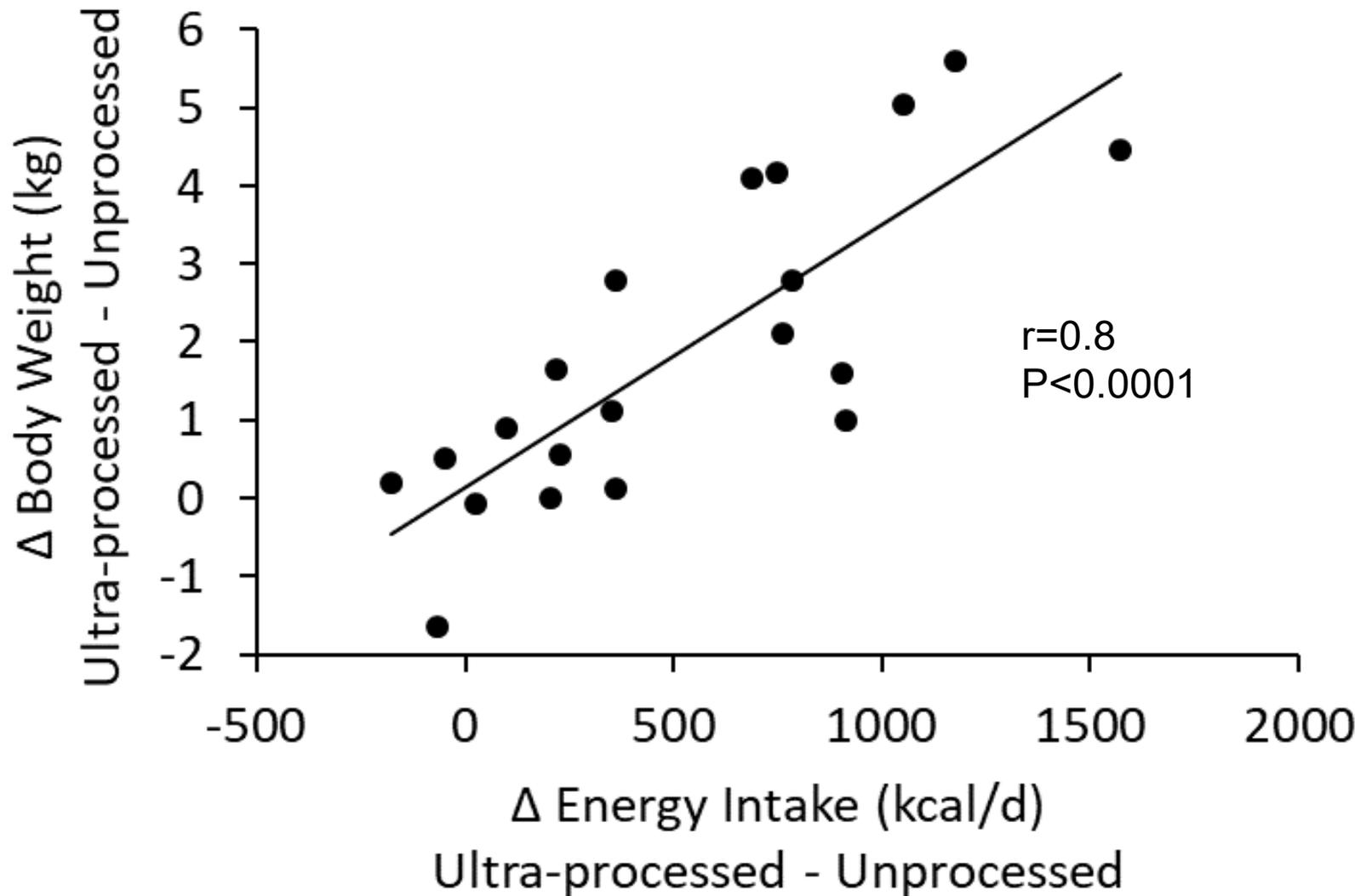
Weight & Fat Gain with Ultra-processed Diets



KD Hall et al. *Cell Metabolism* In press (2019).

<https://osf.io/preprints/nutrixiv/w3zh2>

Highly Correlated Weight & Intake Changes



KD Hall et al. *Cell Metabolism* In press (2019).

<https://osf.io/preprints/nutrixiv/w3zh2>

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Volunteer Study Subjects

Nutrition Science Initiative