

Case Study #2

Why do we need to track
Resting Metabolic Rate (RMR) or
Resting Energy Expenditure (REE)?

First Law of Thermodynamics

Stored Energy

Energy Intake

Energy Expenditure (*TEE*)



=



-



Resting (REE)
(sedentary)
~ 80%

+

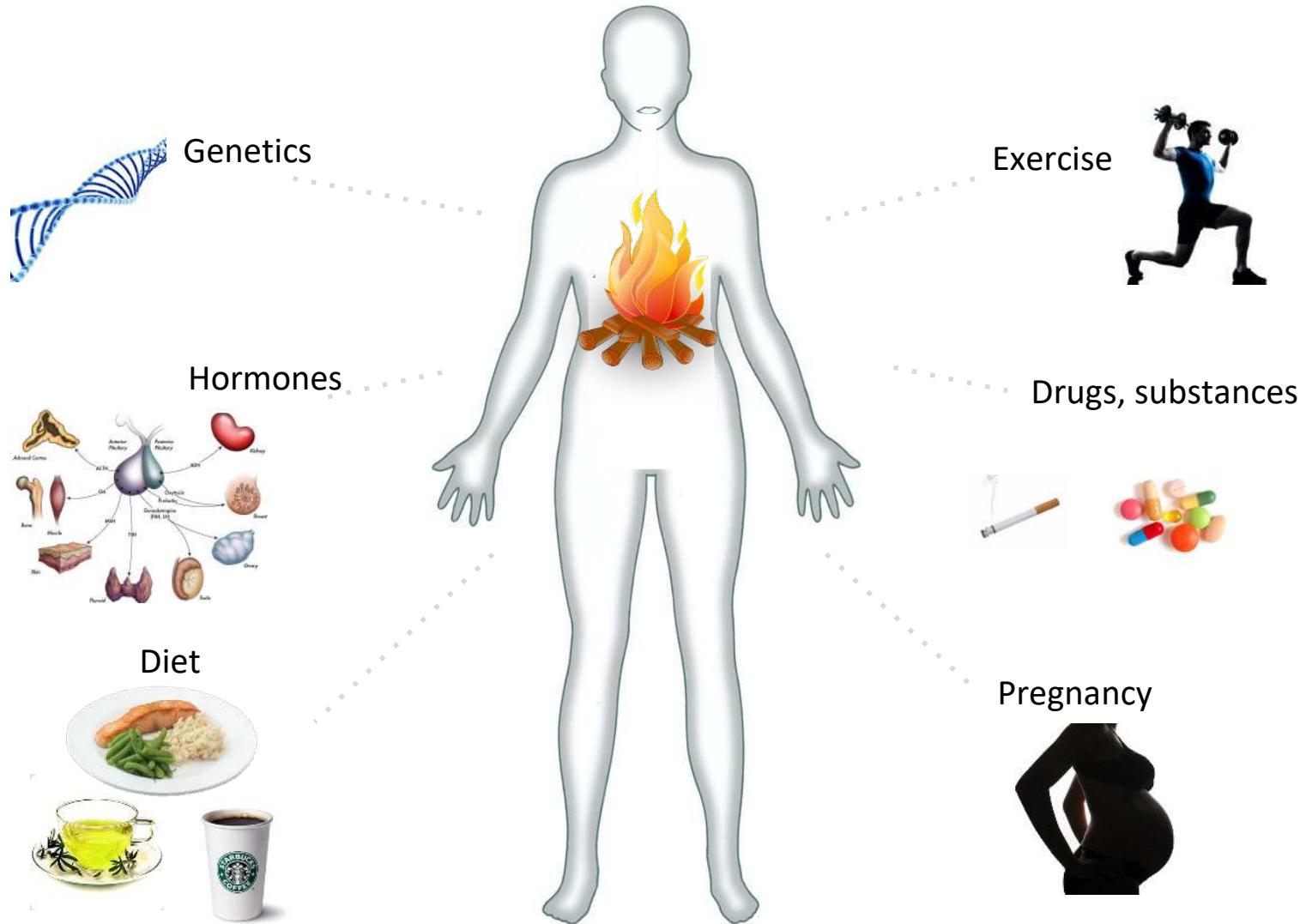


Physical Activity
< 10% (sedentary)

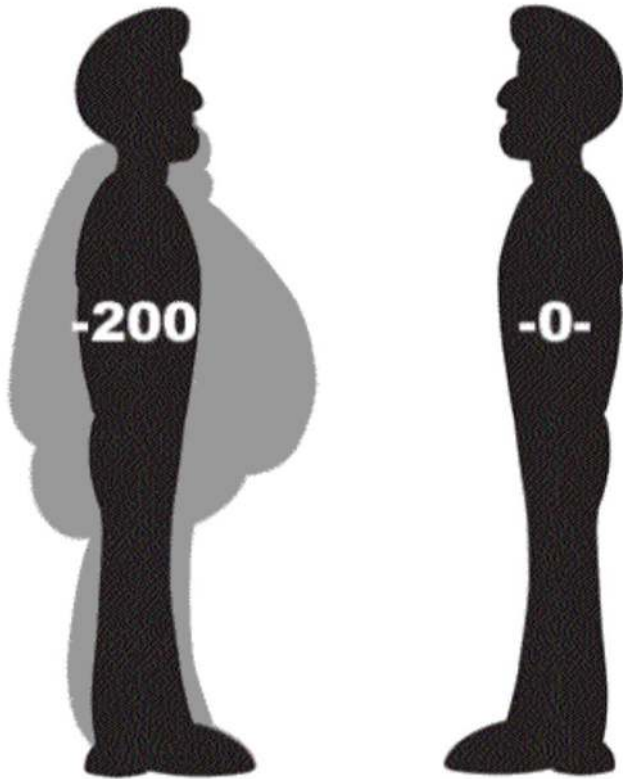


Affordable & Mobile
Technologies

Factors affecting Resting Energy Expenditure



Weight drop and REE drop: Metabolic Adaptation



“The more successful you are at losing weight, the slower your metabolism can be.”

[Dr. Kevin Hall, Ph.D.](#)

Senior Investigator, National Institutes of Health, [NIH.gov](#)

“Persistent metabolic adaptation 6 years after The Biggest Loser competition”

E. Fothergill, J. Guo, L. Howard, J.C. Kerns, N.D. Knuth, R. Brychta, K.Y. Chen, M. C. Skarulis, M. Walter, P.J. Walter, and K.D. Hall*

[Obesity \(Silver Spring\). 2016 Aug; 24\(8\): 1612–1619.](#)

One example from the study: after losing 239 pounds, a participant’s resting metabolism was 200 kcal/day than the expected for someone of his new size. In other words, the participant has to eat 200 kcal/day less, or exercise 200 kcal/day more than his size-paired subject to maintain weight.

REE drop upon 5-10% weight loss

Sustained depression of the resting metabolic rate after massive weight loss¹⁻³

Diane L Elliot, Linn Goldberg, Kerry S Kuehl, and William M Bennett

Am J Clin Nutr 1989;49:93-6.

TABLE 1
Subject characteristics before the protein-sparing modified fast and after weight loss during caloric maintenance*

	Prediet	4 wk postdiet	8 wk postdiet
Total weight (kg)	106 ± 25	77 ± 14†	79 ± 16
Fat-free weight (kg)	55 ± 8	50 ± 8†	53 ± 8‡
Fat (kg)	50 ± 18	27 ± 8†	27 ± 9
Percent fat (%)	47 ± 6	35 ± 5†	33 ± 5

* $\bar{x} \pm SD$.

† $p < 0.001$ for 4 wk postdiet vs prediet.

‡ $p < 0.01$ for 8 wk postdiet vs 4 wk postdiet.

- ✓ REE decreased after 4 weeks of negative energy balance (diet)

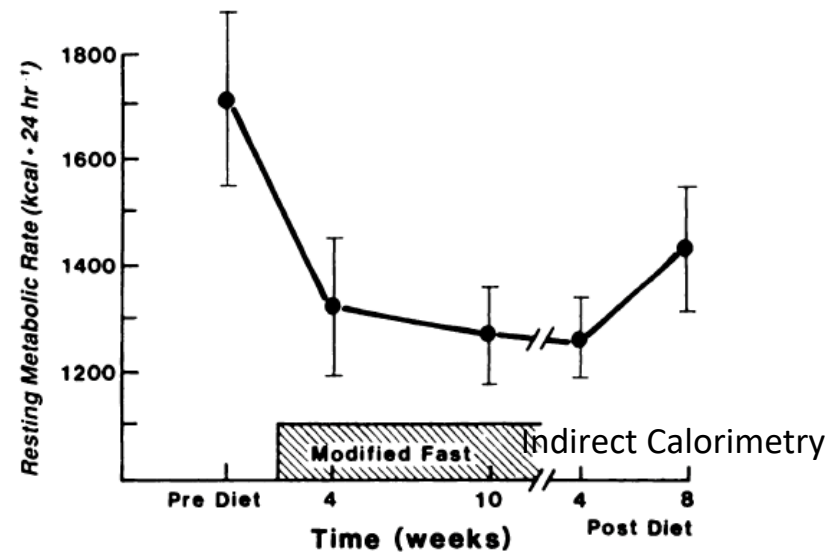


FIG 1. Changes in RMR ($\text{kcal} \cdot 24 \text{ h}^{-1}$) observed in obese women before, during, and after a protein-sparing modified fast. The time effect is significant at $p < 0.001$ by ANOVA. ($\bar{x} \pm \text{SEM}$.)

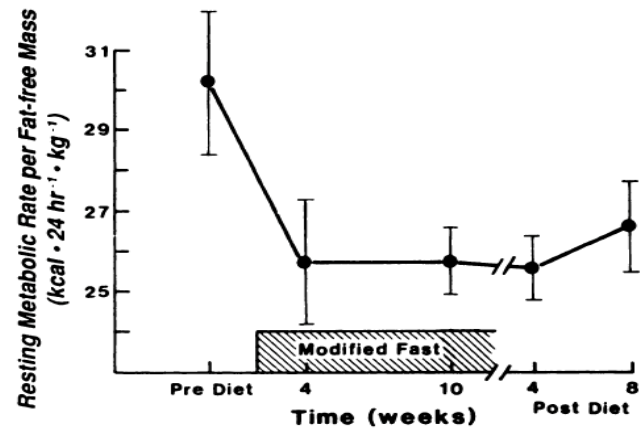


FIG 2. Changes in RMR per fat-free mass ($\text{kcal} \cdot 24 \text{ h}^{-1} \cdot \text{kg}^{-1}$) observed in obese women before, during, and after a protein-sparing modified fast. The time effect is significant at $p < 0.01$ by ANOVA. ($\bar{x} \pm \text{SEM}$.)

Study Cases

Diet

Changes in diet can significantly change metabolism. For example, a crash diet can cause drastic reduction in metabolic rate, leading to a “weight loss plateau”.

U of Arizona, Dr. C. Stump, MD, PhD [Ow/Ob Patients](#)
Banner Health, Dr. F. Soto, MD, Obesity Week, 2017

Exercise

Exercise can affect metabolism. For example, muscle-building increases metabolism and High Intensity Intermittent Training (HIIT) creates an “afterburn” effect.

Training Facility/ASU, B. Ainsworth, [HIIT](#), “Personal Mobile Tracking of Resting and Excess Post-Exercise Oxygen Consumption with a Mobile Indirect Calorimeter”
Issue no. 11, 2019, Gazzetta Medica Italiana - Archivio per le Scienze Mediche

Hormones/medication/supplements

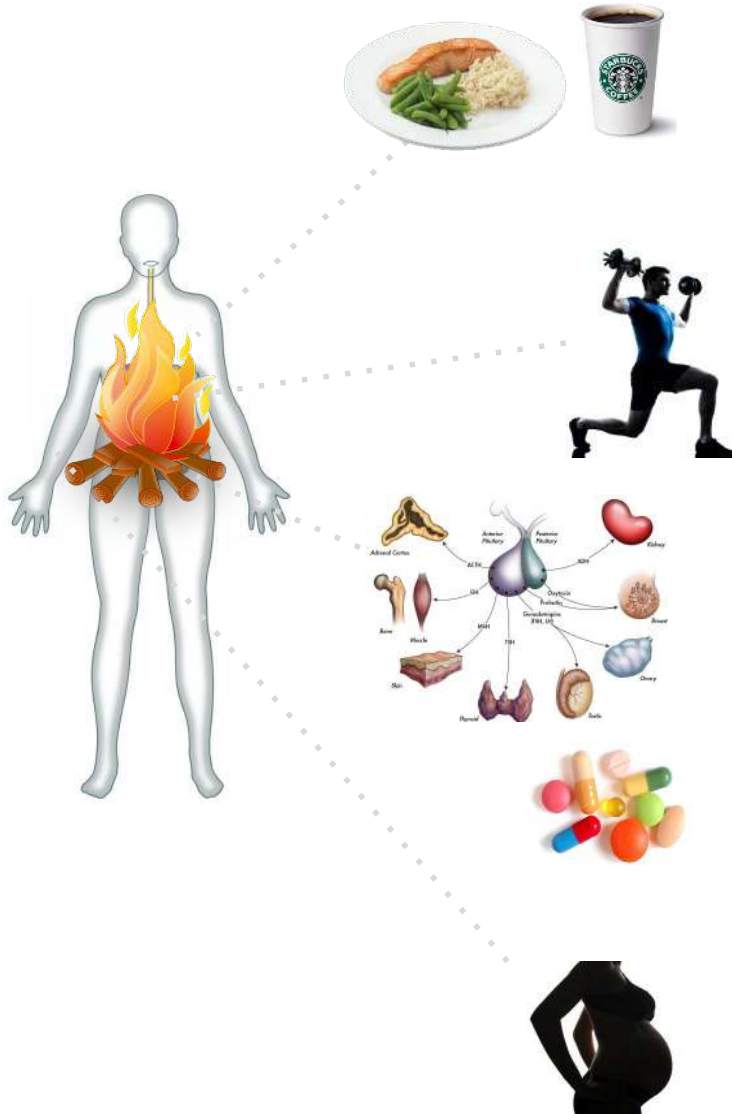
Hormonal changes (hyper- or hypo-thyroidism), medications, supplements can change metabolism.

Omnic Actives, Dr. V. Juturu, [Capsacinoids](#)

Pregnancy

Metabolism changes significantly throughout pregnancy and after giving birth. Tracking metabolism helps the mother maintain and achieve the proper weight for the baby’s healthy growth.

ASU, Dr. C. Wisner, Nutrition, PhD. [Pregnancy](#)
Penn State, Dr. D. Downs, Obesity Week 2017, NIH study



Thank YOU !

Questions to:

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