THE 3RD YoGHURT SUMMIT

FROM SCIENCE TO PERFORMANCE

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#FuelYourPassion

Nicki De Villiers (RD)

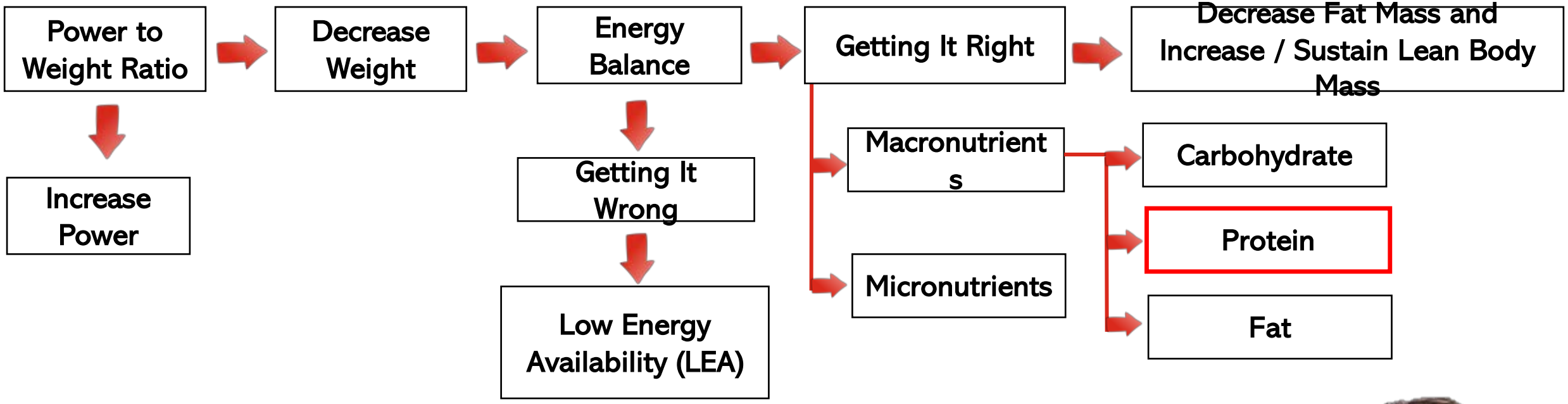
Registered Dietitian with a

Special Interest in Sports Nutrition

Optimising Power To Weight Ratio Without Compromising Nutrition

Nicki de Villiers

With The End In Mind



Dietary considerations to achieve high quality weight loss recognising the dynamic energy balance

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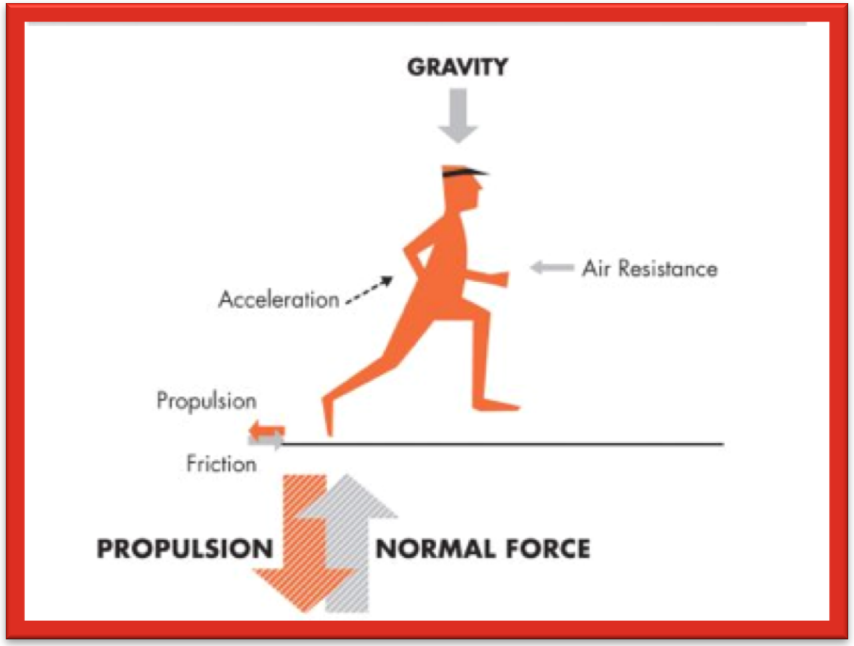
Power To Weight Ratio: What Is In It For The Athlete?

- Determinant of performance:
  - Where athletes work against gravity, e.g. running
- High power to weight ratio:
  - More power with every action
  - Run, swim and cycle faster and more efficiently



- 0.45 kg excess weight requires ~ 2 watts to pull up a hill
- 3 kg of fat = ~ 3 sec/km on a climb
- ↓ 4.5 kg → climbing 7-10 % faster

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Changing Power to Weight Ratio

Power to Weight = Power ÷ Weight

To improve power to weight ratio:

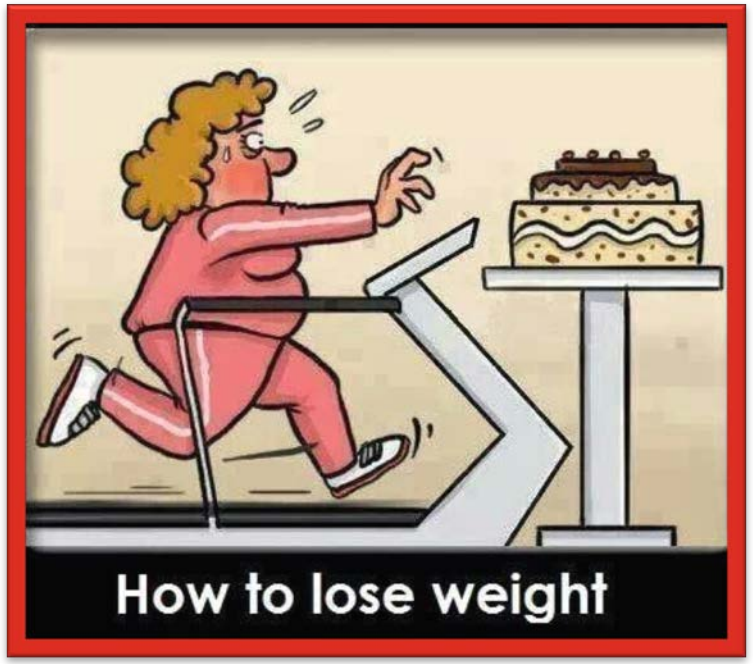
- ↑ power output while keeping their weight constant
- keep the power output constant while ↓ weight
- ↑ power output while also ↓ weight

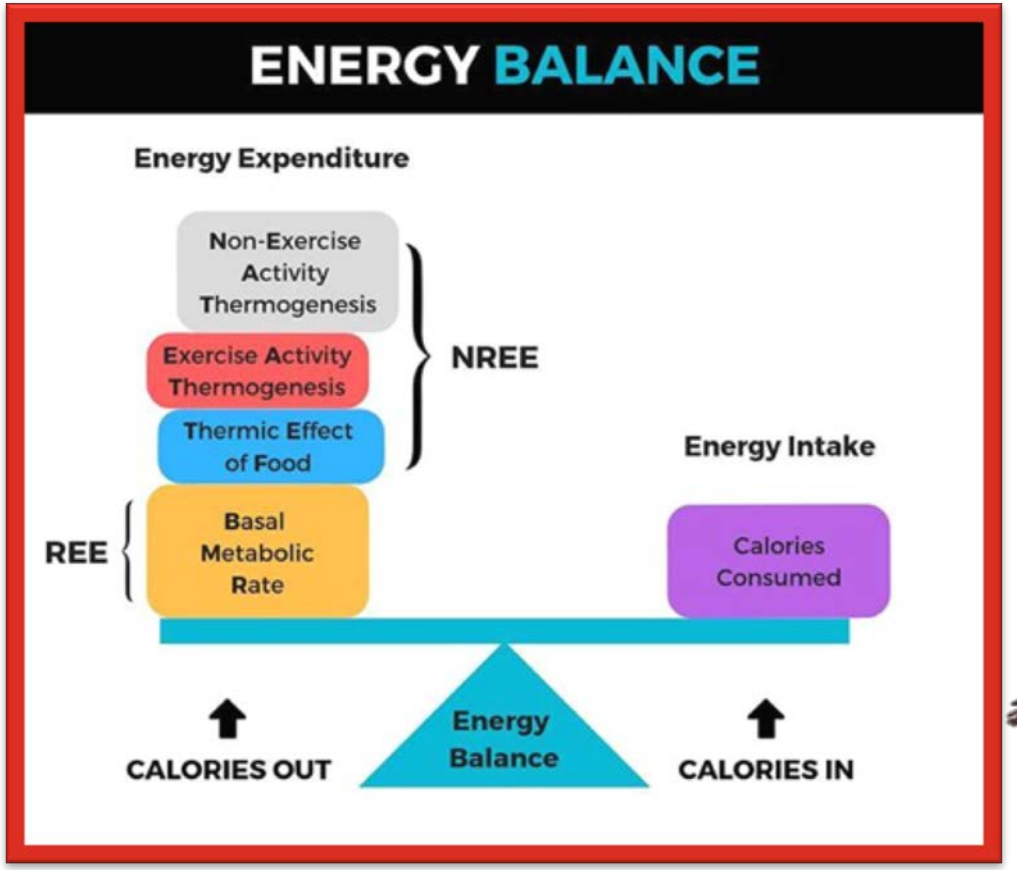
Ideal Approach: Athlete's Goals + Current Level of Fitness + Current Weight

Weight Loss Is Not Simple

Just increase energy expenditure

and/or reduce energy intake





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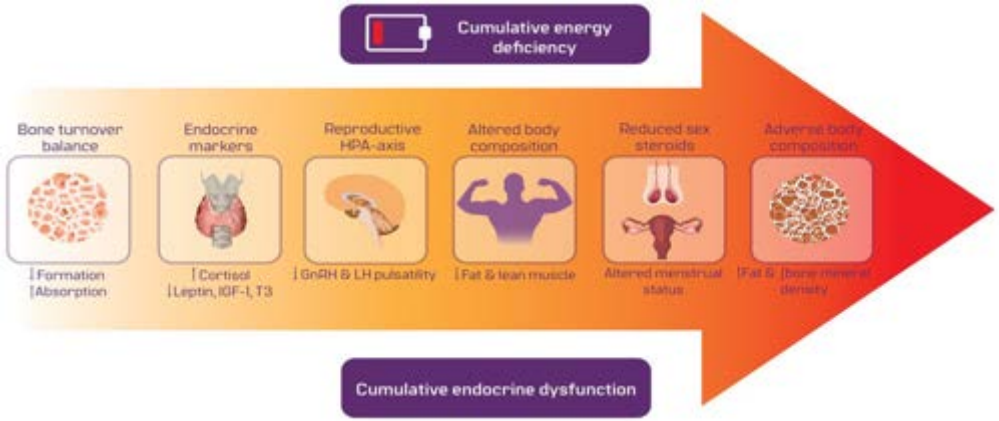
Getting It Wrong

- *Energy availability (EA) = Energy intake (EI) - exercise energy expenditure (EEE) in relation to fat-free mass (FFM)*
- Energy expenditure associated with prescribed training load is already committed
- Energy mismatch (i.e., initial energy deficit) → adjustment in expenditure on the non-exercise body functions

Short Period (5 days) of EA <30 kcal/kg FFM/day = Severe Endocrine and Metabolic Alterations



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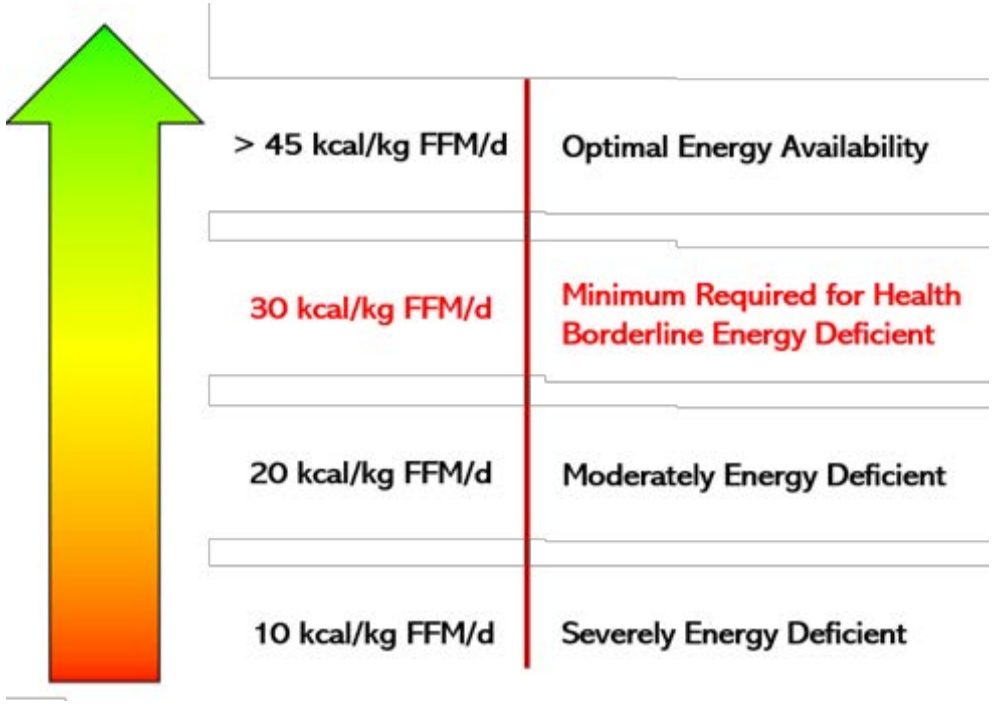
Classification on Energy Availability



High EA: healthy weight gain or weight maintenance
Adequate energy for physiological functions

Subclinical LEA: tolerated for short periods during well-constructed weight-loss program

Clinical LEA: health implications with impairment of body systems including training adaptation and performance

Severe energy restriction to decrease weight will negatively affect performance and health

Achieving HEALTHY Body Weight

- Minimises health risks and promotes good eating habits
- Allowing for optimal training and performance
- Consideration for genetic makeup
- Appropriate for age and physical development
- Maintained without constant dieting or restriction
- Regain some weight during off-season

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Getting It Right: Fat Mass vs Lean Body Mass

- Hypocaloric dieting → ↓ fat mass and ↓ lean body mass
- How to minimise ↓ lean body mass while maximising fat loss

High Quality Weight Loss

- Diet-induced weight loss with slow ratio of skeletal muscle to fat mass loss
- Minimum healthy body fat


14%


6%

Individualised and Structured

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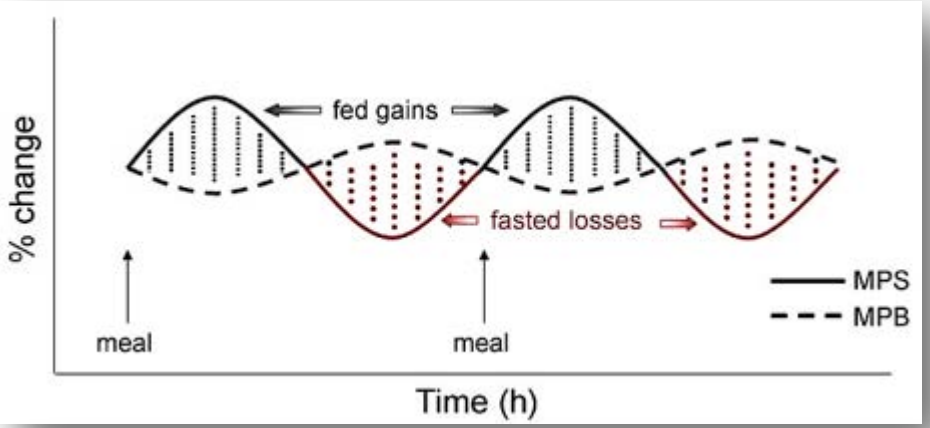
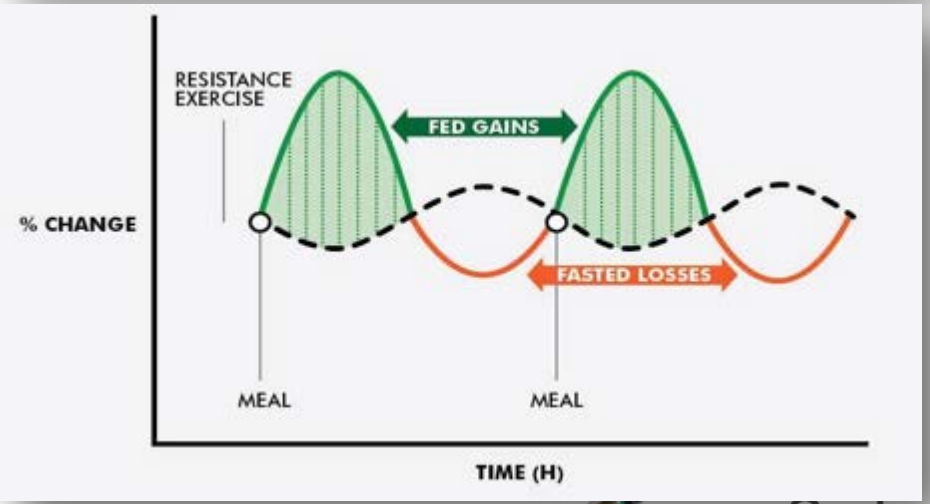
Lean Body Mass

- Metabolic function
- Muscle protein synthesis (MPS) vs muscle protein breakdown (MPB)
- Effects of :
  - Fasting → ↓ muscle protein synthesis + ↑ muscle protein breakdown
  - Essential amino acids → ↑ muscle protein synthesis
  - Leucine → ↑ muscle protein synthesis
  - Protein → ↑ insulin → ↓ muscle protein breakdown
  - Energy restriction → ↓ muscle protein synthesis
  - Resistance exercise (and aerobic exercise) → ↑ MPS and ↑MPB

→ Sensitises skeletal muscle to anabolic effects of protein

→ synergistic rise in MPS → gain of lean body mass





Energy Restriction & Lean Body Mass

- Energy restriction → cell is forced to prioritise energy demands → ↓ muscle protein synthesis
- Meta-analysis: ~25% of mass lost during weight loss during energy restriction is *fat free mass*
- Muscle protein synthesis response may adapt to more prolonged weight loss

Weight Loss: Phases Instead of as a Continuous Process

- Early phase (days to a few weeks): rapid weight loss with more pronounced lean body mass loss
- Plateau is reached as weight loss progresses
- Adaptations to new "steady-state" as weight loss progresses

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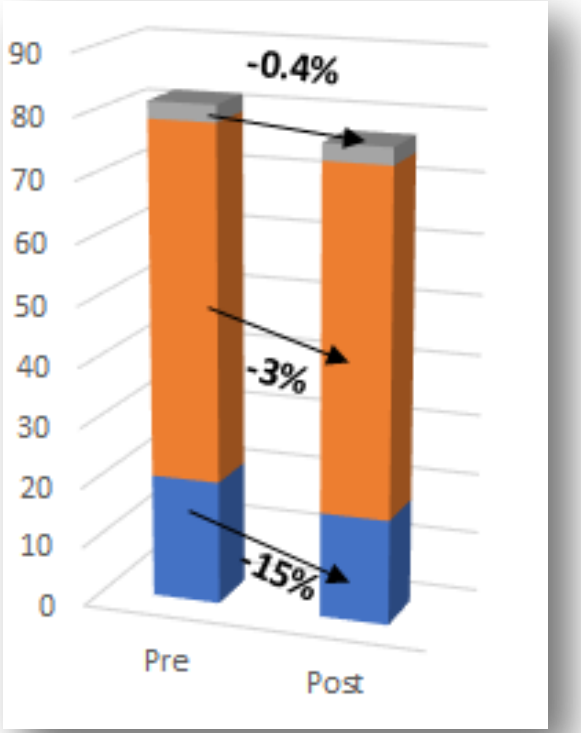
*Every-Other-Day F*eeding Caloric Restriction Interventions

12 healthy males, 18–50 years old, physical activity >3 but <6 days per week

Caloric restriction (33 %) on 3 alternate days / week for 6 weeks

- ↓ body weight by 4.4% (0.9 kg/week)
- ↓ fat mass by 15.1%
- ↓ lean body mass by 2.91%
- ↓ total body water (69% of total body weight loss)
  - extracellular ↑
  - intracellular ↓
- significantly ↓ daily micronutrient intake to 90% of RDA values

  → micronutrient supplement should also be considered



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Energy Restrictions: Two Groups Weight Lifters

Normal diet: 3 000 – 3 500 calories per day
Restrict energy intake with 40 % for two weeks

Group 1:
1.6g protein/kg/day
(~ 15% of total calories)

Group 2:
2.3 g protein/kg/day
(~ 36% of total calories)

→ Both groups lost the same amount of fat

→ Lost more total weight
Lost an average of 1.5 k g muscle mass

→ Lost little if any muscle

Caloric Restriction & Protein Manipulation

- 40% energy restricted diet
- Relatively trained but overweight young men
- Resistance exercise + high intensity interval training program (6 days/week)
  - → 1.2 g protein/kg/day → maintained lean body mass and -3.5 ± 1.4 kg fat mass in 4 weeks
  - → 2.4 g protein/kg/day → gained lean body mass and −4.8 ± 1.6 kg fat mass in 4 weeks

(Longland et al., 2016)

Lean body mass loss could be avoided by ↑ protein intake

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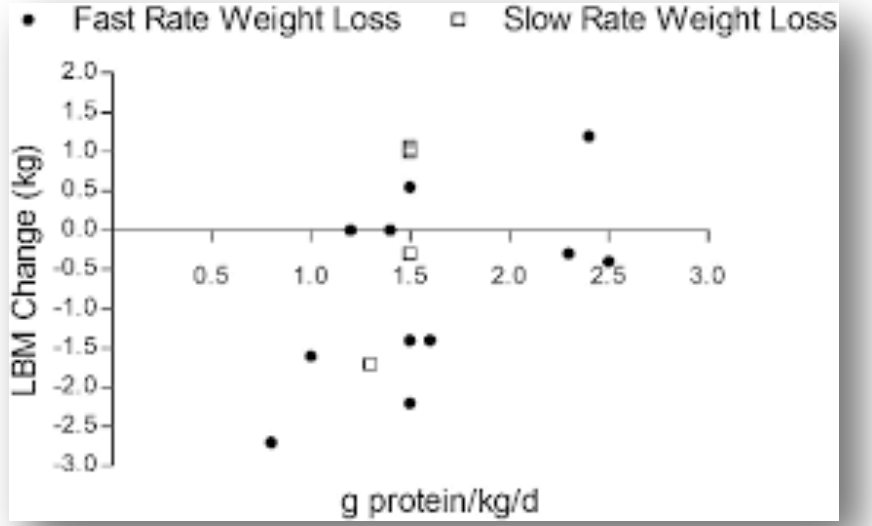
Protein: How Much? What? When?

- Protein during weight loss in athletes
  - ➡ 1.6–2.4 g protein/kg/day
- Energy balance:
  - ➡ ~0.24 g protein/kg at each meal
- Weight maintenance or weight gain:
  - ~0.3–0.4 g protein/kg per meal
- Mixed meals or energy deficit / weight loss:
  - ➡ 0.4–0.5g/kg



Higher protein intakes and slower rates of weight loss promote LBM retention during energy restriction

Mettler, et al., 2010

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Protein: How Much? What? When?

- Higher-quality proteins → potent stimulators of MPS → *leucine*
- Young male novice weight lifters: Energy balance + nonfat milk following resistance exercise (12 w)

  → greater gains in LBM and greater ↓ in FM compared to soy protein

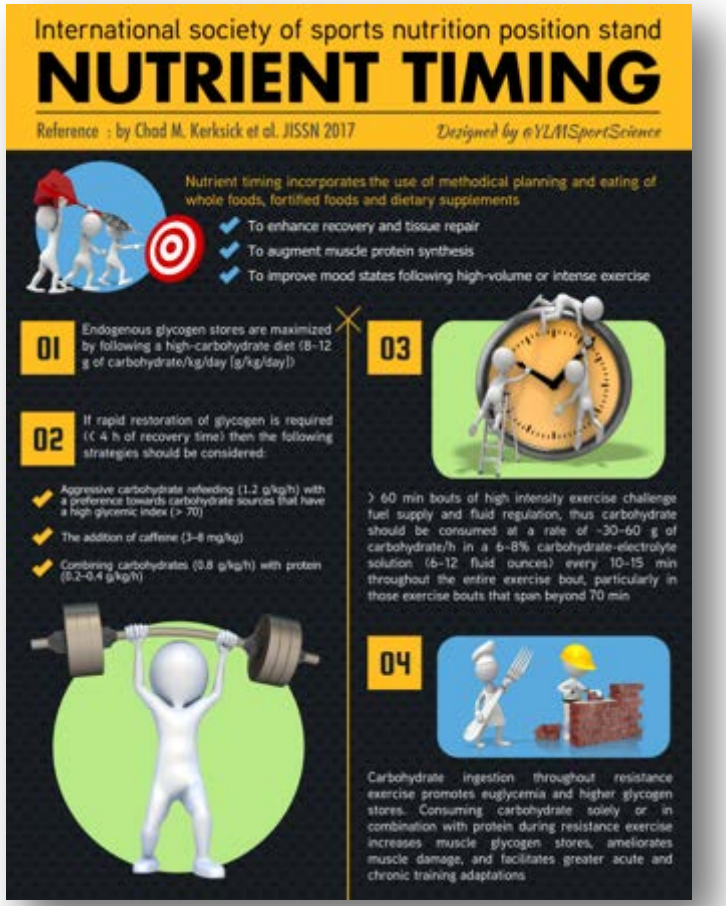
Hartman et al., 2007

- Meta-analyses: ↑ dairy consumption during energy restriction → superior LBM retention and FM loss

Abargouei et al., 2012; Chen et al., 2012

Some evidence to support role for whey in promotion of high-quality weight loss during caloric restrictions

Protein: How Much? What? When?



- **Throughout the day**

  → 20 g protein every 3 hours

- **After exercise**
  - Essential amino acids (EAAs) ↓ muscle protein breakdown
  - **Endurance athletes** → ↑ mitochondrial proteins
- **During exercise**
  - Not necessary if sufficient daily protein
- **Before sleep**
  - Stimulate MPS and improved overnight protein balance → *40 g protein*

Something Needs To Give: Carbohydrate Manipulation

- **Low CHO (≤ 35–40% energy) → ↑ weight and fat loss**
  - → Associated with greater FFM loss
  - → Influence on sports performance and training ability

- **CHO: important in maintaining athletic performance**
  - ~5–7 g/kg/day for modest (likely aerobic) exercise (~1 hr/day)

- **During dietary energy restriction with high protein intake**
  - → 3g CHO/kg/day

In Summary : Quality Weight Loss

- Dynamic energy balance approach to predict weight loss based on dietary and exercise changes
- Moderate energy deficit (−500 kcal)
- Higher protein intake when energy is restricted: ~1.8–2.7 g/kg/d (or ~2.3–3.1 g/kg/FFM)
  - post-exercise consumption ~0.25–0.3g/kg
  - high leucine content and rapid digestion kinetics *(i.e. whey protein or skimmed milk)*
- Time food intake around exercise and throughout the day
- Monitor consumption of energy dense beverages

END THANK YOU