Metabolism and Body Composition: The Facts Behind the Assumptions

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Research Institute Director
MusclePharm Corporation Sports Science Institute
Faculty: United States Sports Academy
Body Composition Basics
What are we (Mostly) made of?
%Fat... as we know it
%Fat and FFM

- FFM is EVERYTHING!!! Except (ALL) the fat!
  - 100% Fat Free 😊
Regional adipose tissue defined

**Adipose tissue type**
- Subcutaneous (white arrow)
- Visceral (red arrows): omental (near pancreas), mesenteric (around intestines), epicardial (around heart)

**Visceral adipose tissue**
- increased in obesity
- more pro-inflammatory phenotype
Adipose Tissue (AT)

“Adipose tissue, being the morphological dimension, can be defined anatomically as the paniculus adiposus (e.g. subcutaneous, intramuscular, and visceral) including connective tissue and microscopic blood supply and nerves.” (Provyn, 2008)

Total Body Fat (%Fat)

Water 16.2%
Lipids/Fat, Connective Tissue, etc. 83.8%

Adipose Tissue (BIG Fat Cells)

Water 83.2%
Lipids/Fat, Connective Tissue, etc. 16.8%

Adipose Tissue (SMALL Fat Cells)
**Muscle Mass (MM)**

*NOT Fat-Free Mass (FFM)*

*FFSMM = Fat-Free Skeletal Muscle Mass*

**FFM of Skeletal Muscle**

- **Endurance/More Slow Twitch**
  - Water: 80.40%
  - Protein: 19.60%

- **FFM of Skeletal Muscle (FFSMM)**
  - Strength/More Fast Twitch
  - Water: 67.50%
  - Protein: 32.50%
BMI and Health

What’s the right number?
<table>
<thead>
<tr>
<th>Classification</th>
<th>BMI (kg/m²)</th>
<th>Principal cut-off points</th>
<th>Additional cut-off points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>≤18.50</td>
<td>≤18.50</td>
<td></td>
</tr>
<tr>
<td>Severe thinness</td>
<td>≤16.00</td>
<td>≤16.00</td>
<td></td>
</tr>
<tr>
<td>Moderate thinness</td>
<td>16.00 - 16.99</td>
<td>16.00 - 16.99</td>
<td></td>
</tr>
<tr>
<td>Mild thinness</td>
<td>17.00 - 18.49</td>
<td>17.00 - 18.49</td>
<td></td>
</tr>
<tr>
<td>Normal range</td>
<td>18.50 - 24.99</td>
<td></td>
<td>18.50 - 22.99</td>
</tr>
<tr>
<td>Overweight</td>
<td>≥25.00</td>
<td>≥25.00</td>
<td>≥25.00</td>
</tr>
<tr>
<td>Pre-obese</td>
<td>25.00 - 29.99</td>
<td></td>
<td>25.00 - 27.49</td>
</tr>
<tr>
<td>Obese</td>
<td>≥30.00</td>
<td>≥30.00</td>
<td>≥30.00</td>
</tr>
<tr>
<td>Obese class I</td>
<td>30.00 - 34.99</td>
<td>30.00 - 32.49</td>
<td></td>
</tr>
<tr>
<td>Obese class II</td>
<td>35.00 - 39.99</td>
<td>35.00 - 37.49</td>
<td></td>
</tr>
<tr>
<td>Obese class III</td>
<td>≥40.00</td>
<td>≥40.00</td>
<td></td>
</tr>
</tbody>
</table>
WHO

• “BMI values are age-independent and the same for both sexes. However, BMI may not correspond to the same degree of fatness in different populations due, in part, to different body proportions. The health risks associated with increasing BMI are continuous and the interpretation of BMI gradings in relation to risk may differ for different populations.”
BMI, Health, and Mortality

- Research has shown that the lowest risk of mortality is in people with BMI's between 25 and 30. Look at ages 25-59! (Katherine M. Flegal, JAMA, 2005)
BMI, Health, and Mortality

- Research has even indicated that cardiovascular disease risks are less with a BMI between 25 and 30. (Katherine M. Flegal, JAMA, 2007)
Figure 2. Excess Deaths by Body Mass Index Category for Subgroups of Cardiovascular Disease and Cancer Deaths—Balanced Follow-up

BMI, body mass index, which is calculated as weight in kilograms divided by height in meters squared; CVD, cardiovascular disease. Error bars indicate 95% confidence intervals.
Take Home Message

• Further investigations are needed.
• A little extra fat is OK, and may even keep you healthier if you also exercise and eat right, don't smoke, limit alcohol, etc.
  – However, this fat needs to be maintained and not slowly increased. There is such a thing as healthy fat, especially in the elderly. We also need to consider where the fat is located, waist to hip ratios show the more central adiposity the greater your risk. But, just like with BMI, we see the problems with using one method to classify at risk individuals. A more comprehensive approach should be taken when classifying an individual’s risk factors.
Take Home Message

• We can’t really make a definitive conclusion about BMI, health, and mortality since the data is not in agreement when comparing BMI’s between 20-24.9 and 25-29.9. Another important finding is that relative/hazard risk is non-linear, meaning the number of excess deaths increases rapidly at both lower and higher BMI’s under 20 and over 30, suggesting the clear relationship between health and mortality and Obesity and underweight.

• Still, many researchers have concluded that there is a greater risk with people who “become” overweight because nearly 1/4 of those overweight eventually become obese, which increases their risk... Eventually.
Gain More Muscle and Burn More Fat

Is it really that simple?
Yes it’s TRUE...

$1\text{MJ} = 239 \text{ Kcal}$

$1\text{kg} +/\ - 21.51$

$1\text{lb} +/\ - 9.76$

As we age

Young
1kg +/- 19.12
1lb +/- 8.67

Old
1kg +/- 8.99
1lb +/- 4.08

Anja Bosy-Westphal, Nutr & Aging, 2003

**FIGURE 2** REEm plotted against FFM\textsubscript{DXA} in 26 young and 26 elderly subjects. FFM, fat-free mass; REEm, resting energy expenditure measured.
What Burns Calories at Rest?

- Collectively, skeletal muscle, bone, and adipose tissue contributed to 69.8 and 73.4% of body mass in men and women, whereas respective contributions to REE were 30.9 and 31.7%, respectively. The small residual mass, 30.1% of body mass in men and 26.6% in women, contributed to 69.1 and 68.3% of predicted REE, respectively.

Fig. 6. Four tissue/organ components in females and males expressed as a fraction of body mass (A) and as their respective fractional contributions to REE (B).
The present study strongly supports the hypothesis that fat-free mass is not an energetically homogeneous compartment but varies systematically in heat-producing components as a function of body mass and fat-free mass.
“The anticipated effect, one that is actually observed in vivo, is a lowering of REE relative to fat-free mass with increasing body size and fat-free mass.”
It’s not that Bad

Adding FFM increases Metabolism

• 1kg increase = -0.14 Kcal (loss)
• 1lb increase = -0.065 Kcal (loss)
• If you added 5lb’s of muscle mass (FFM)
  – +48.8 Calories a day
  – -0.065
  – Net Gain = +48.73
• If you added 10lb’s of muscle mass (FFM)
  – +97.6 Calories a day
  – -0.13
  – Net Gain = +97.47
### Perspective

<table>
<thead>
<tr>
<th>FFM Gain (lb)</th>
<th>Additional Resting Calories Needed per day (kCal)</th>
<th>Food Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.8</td>
<td>Just over 3 grapes</td>
</tr>
<tr>
<td>5</td>
<td>48.8</td>
<td>1 Apple, 1 Chicken McNugget</td>
</tr>
<tr>
<td>10</td>
<td>97.6</td>
<td>1 Banana, 1.2 oz Top Sirloin</td>
</tr>
<tr>
<td>15</td>
<td>146.4</td>
<td>12 oz Minute Maid Orange Juice</td>
</tr>
<tr>
<td>20</td>
<td>195.2</td>
<td>3.5 oz Ground Beef (&lt;1/4 lb burger patty)</td>
</tr>
<tr>
<td>25</td>
<td>244.0</td>
<td>20oz bottle of Coke/1 Slice Pep Pizza</td>
</tr>
<tr>
<td>30</td>
<td>292.8</td>
<td>1 Egg McMuffin, 1 Chicken Breast</td>
</tr>
<tr>
<td>35</td>
<td>341.6</td>
<td>Taco Bell Beef Chalupa Supreme</td>
</tr>
<tr>
<td>40</td>
<td>390.0</td>
<td>Filet-o-fish, &lt; ½ Double Quarter Pounder</td>
</tr>
</tbody>
</table>
## Perspective

<table>
<thead>
<tr>
<th>FFM Gain (lb)</th>
<th>Additional Resting Calories Needed per day (kCal)</th>
<th>Fat loss due to reduction in calories if diet is maintained with increase in FFM</th>
<th>Days (years/months) to lose 1 lb of fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.8</td>
<td>1.09</td>
<td>3214.29 (8.8 yr)</td>
</tr>
<tr>
<td>5</td>
<td>48.8</td>
<td>5.42</td>
<td>645.49 (1.8 yr)</td>
</tr>
<tr>
<td>10</td>
<td>97.6</td>
<td>10.84</td>
<td>322.75 (8.2 months)</td>
</tr>
<tr>
<td>15</td>
<td>146.4</td>
<td>16.27</td>
<td>215.16 (5.4 months)</td>
</tr>
<tr>
<td>20</td>
<td>195.2</td>
<td>21.69</td>
<td>161.37 (4.1 months)</td>
</tr>
<tr>
<td>25</td>
<td>244.0</td>
<td>27.11</td>
<td>129.10 (3.3 months)</td>
</tr>
<tr>
<td>30</td>
<td>292.8</td>
<td>32.53</td>
<td>107.58 (2.7 months)</td>
</tr>
<tr>
<td>35</td>
<td>341.6</td>
<td>37.96</td>
<td>92.21 (2.3 months)</td>
</tr>
<tr>
<td>40</td>
<td>390.0</td>
<td>43.33</td>
<td>80.77 (2 months)</td>
</tr>
</tbody>
</table>
Perspective

• If you were to gain 50lbs of FFM
  – 2 months to lose 1lb of fat (assuming you didn’t add any additional calories to your diet)
  – That’s only 0.5 lb’s per month!
  – Or 6 lb’s of fat loss in 1 year

• Adding FFM to burn fat... Good strategy?
Consider if you MOVED that new FFM!

**Activity (1 hour)**

<table>
<thead>
<tr>
<th>Activity</th>
<th>130 lbs</th>
<th>155 lbs</th>
<th>190 lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running, 10 mph (6 min mile)</td>
<td>944</td>
<td>1126</td>
<td>1380</td>
</tr>
<tr>
<td>Running, 5 mph (12 min mile)</td>
<td>472</td>
<td>563</td>
<td>690</td>
</tr>
<tr>
<td>Running, stairs, up</td>
<td>885</td>
<td>1056</td>
<td>1294</td>
</tr>
<tr>
<td>Scrubbing floors, on hands and knees</td>
<td>325</td>
<td>387</td>
<td>474</td>
</tr>
<tr>
<td>Skiing, cross-country, vigorous effort</td>
<td>531</td>
<td>633</td>
<td>776</td>
</tr>
<tr>
<td>Stair-treadmill ergometer, general</td>
<td>354</td>
<td>422</td>
<td>518</td>
</tr>
<tr>
<td>Swimming, leisurely, general</td>
<td>354</td>
<td>422</td>
<td>518</td>
</tr>
<tr>
<td>Walking, 2.0 mph, slow pace</td>
<td>148</td>
<td>176</td>
<td>216</td>
</tr>
<tr>
<td>Walking, 3.5 mph, uphill</td>
<td>354</td>
<td>422</td>
<td>518</td>
</tr>
<tr>
<td>Walking, 4.0 mph, very brisk pace</td>
<td>236</td>
<td>281</td>
<td>345</td>
</tr>
<tr>
<td>Walking, upstairs</td>
<td>472</td>
<td>563</td>
<td>690</td>
</tr>
</tbody>
</table>
1 Calorie = 1 Calorie
Are all calories created equal?
A Calorie ≠ A Calorie (TEF)

• "A calorie is a calorie" violates the second law of thermodynamics
  – Richard D Feinman and Eugene J Fine
  – Nutrition Journal, 2004

• *Thermic Effect of Feeding* - Represents the amount of energy it takes to digest, absorb, and metabolize the food we eat.
  o TEF represents between 5% and 15% of daily energy.
  o TEF for carbs or protein only meals occurs within 5-10 min post-ingestion.
  o TEF occurs up to 4 hours after a meal.

• In general:
  – Protein – 20 to 30%
  – Carbohydrate – 5 to 10%
  – Fat – 0 to 3%

• The 20-30% means that for every 100 kcals ingested (for protein), you burn ~20-30 kcals to digest/absorb it.

Fat type matters

MCT (medium chain triglycerides) - (Hill et al 1989)

![Graph showing energy expenditure and calories burned above rest for LCT and MCT](image)
Olive Oil – (Rodriguez et al 2002); Olive oil may ↑ metabolism

![Bar graph showing oxygen consumption in mmol/kg*min for different oils: Olive oil (70), sunflower (61), beef (62), palm (60).]
Timed Protein ↑ Energy Expenditure

- Consume 20 minutes pre-weight training.
- ~90 kcals
  - 18 g whey protein, 2 g carb, 1.5 g fat
  - 1 g whey protein, 19 g carb, 1 g fat

At 24 hours post, REE was greater with Protein feeding vs Carbs.

“Increasing REE could facilitate reductions in body fat mass and improve body composition if nutritional intake is stable.”
Higher PRO vs. Traditional

- Healthy men and women
- Assessed 24-hour response to isocaloric feedings:
  - 1) 60% carb, 30% fat, 10% protein
  - 2) 40% carb, 30% fat, 30% protein

Higher PRO = Greater TEF

24-hr kcal

- 60-30-10
- 40-30-30
Overfeeding: CHO vs. FAT/PRO

- Addition of 20 kcal/kg body weight of either candy or roasted peanuts, to the regular caloric intake.
- Duration: two weeks; Healthy men and women
- That’s equal to an extra 1545 kcals for an avg. male (~170 lb).

Body-weight and waist circumference increased significantly only in the candy group.

LDL cholesterol increased in the candy group.

REE increased only in the peanut group.
CONCLUSION: Two weeks of snacking based on peanuts (fat-protein) is better for you than candy (high GI carbs).

Not all calories are created equally.

Krispy Kreme Diet? Go for it 😊
Diet
books.google.com/books?isbn=141090881X
Joanna Kedge, Joanna Watson - 2004 - Preview - More editions
Explains what it means to have a healthy diet, the positive effects on the body of eating good food, as well as the negative effects of an unhealthy diet and how to improve eating habits.

The F-Factor Diet: Discover the Secret to Permanent Weight Loss
books.google.com/books?isbn=0399533745
Tanya Zuckerbrot - 2007 - Preview - More editions
Citing the role of fiber in the establishment of a permanent healthy diet and weight-loss goals, a top nutritionist provides more than seventy-five recipes and definitive guidelines designed to help readers bolster energy levels, lower

Flat Belly Diet!
books.google.com/books?isbn=1605295620
Liz Vaccariello, Cynthia Sass - 2009 - Preview - More editions
Offer advice on how to target middle-body fat stores using strategic food combinations, in a guide that also makes recommendations for reducing stress, sleeping more productively, and staying committed to a healthier lifestyle.
There appears to be a strong interest in manipulating CHO for improving health, wellness and sports performance

<table>
<thead>
<tr>
<th>Extremely Low (&lt;50g)</th>
<th>Low (50 - 150)</th>
<th>Moderate (43-50%)</th>
<th>Moderately High (51-60%)</th>
<th>High (&gt;60%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atkins Diet</td>
<td>Zone Diet</td>
<td>Average American Diet</td>
<td>RDA Food Pyramid</td>
<td>Dean Ornish Diet</td>
</tr>
<tr>
<td>Protein</td>
<td>Carbohydrate Addicts Diet</td>
<td>Abs Diet</td>
<td>The Testosterone Diet</td>
<td>Pritikin Diet</td>
</tr>
<tr>
<td>Ketogenic Diet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(<21%) (21-42%) (43-50%) (51-60%) (>60%)
Let’s look at the Ratio of Carbohydrates to Protein

• Dr. Layman

• Two Exercise Groups: Adult Men and Women

  – Diet one – Low Calorie: RDA Recommended
    – CHO:PRO Ratio (3.5g to 1g)

  – Diet two – Same Low Calories
    – CHO:PRO (1.5g to 1g)
Results

• EX + RDA group (-15% Fat mass)
  – Lost 2.5% muscle mass (not good)

• EX + 1.5 CHO-PRO group (-22% Fat Mas)
  – No change in muscle mass

• Clear metabolic advantage to decreasing your CHO and Increasing PRO during a low calorie diet and exercise program

• “Replacing carbohydrate with protein from meat, poultry, or dairy foods has beneficial metabolic effects and no adverse effects on bone turnover or calcium excretion.”
Wt loss mechanism via carb restriction

• Suppression of appetite
  – via a higher protein intake
• Increased metabolic rate
• Decreased metabolic efficiency
• Shunting of nutrients away from fat storage (vis a vis regulation of insulin)
General Conclusions

• Independent of energy intake, low-carbohydrate/high-protein diets elicit a metabolic advantage; significantly reducing body mass (BM), fat mass, percent body fat and retaining significantly more fat-free mass than diets consisting of greater than 42% of energy from CHO and ≤ 1.05 g/kg/d PRO, respectively.

• In the absence of energy restriction, a reduction in CHO with an increase in PRO and dietary fat (FAT) resulted in significant improvements in BM, total cholesterol, triglycerides, and total cholesterol-to-high-density lipoprotein ratio compared to a diet consisting of 54% CHO, 16% PRO and 30% FAT.

• Increased satiety and thermogenesis are also commonly reported in response to a high-protein versus normative-protein (~15% of total energy from PRO) diet.

Protein – Shattering the Myths

• There is no evidence that high protein diets are harmful to your kidneys.


Eating all the time vs. Fasting

Is one better than the other?
Based on what we know

• Is eating small meals throughout the day really going to increase your metabolism?
  – What does this really do?
• Is fasting a good strategy to cut out weekly calories?
Fasting

• Several studies have shown that when you resistance train even with extreme caloric restriction you can maintain your FFM and lose significant body fat
  – So why do you need to eat “All the time”

Why solving the obesity epidemic will hurt the economy
Chart 17: Progression of U.S. manufacturing (% of manufacturing GDP by industry)

Source: Bureau of Economic Analysis, BofA Merrill Lynch Global Research
Facts at a Glance

- $683.4 billion: Restaurant industry sales.
- 3.6%: Restaurant industry sales increase in nominal terms.
- 1.2%: Restaurant industry sales increase in real (inflation-adjusted) terms.
- 990,000: Restaurant locations in the United States.
- 4%: Restaurant-industry sales share of the U.S. gross domestic product.
- $1.8 billion: Restaurant industry sales on a typical day.
- 13.5 million: Restaurant industry employees.
- 10%: Restaurant workforce as part of the overall U.S. workforce.
- 47%: Restaurant industry share of the food dollar.
- Eight in 10: Restaurant owners who started their industry careers in entry-level positions.
- Nine in 10: Salaried restaurant employees who started as hourly workers.
- Nine in 10: Restaurants with fewer than 50 employees.
- Seven in 10: Restaurants that are single-unit operations.
• It has been reported that the U.S. produces enough food to supply each person around 4000 calories per day, nearly twice what we need.

• Children eat around 350 calories more per day then they did in the 1970's, and adults consume an additional 500 calories compared to the 70’s.

• If everyone skipped one meal every day, we would be eating the same amount of food as we were 30 years ago, when obesity rates were low. However, consider the consequences of skipping one meal on the economy.

• If lunch costs around 5 dollars and all Americans skipped this meal, there would be a loss of revenue exceeding 1.5 billion dollars per day (over $560 billion each year), or a 34% decrease in total revenue for the food industry.
Who wants you “Eating-all-day”? 

TOTAL SPONTANEOUS AD RECALL - INDUSTRIES

![Graph showing industry recall percentages for different waves.]

Food & Beverages Industry contributed 15% of overall TV advertising in H1 '07

![Pie chart showing segmentation of 'Food & Beverages'.]

Copyright © 2013 The Nielsen Company
Physical Activity is KEY

Insert Subtitle Here
The Wheel lock model

<table>
<thead>
<tr>
<th>Human eq. age (yr)</th>
<th>Days 0-21</th>
<th>Days 21-28</th>
<th>Days 28-42/-70</th>
<th>1-7 day WL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>Spent with mom (no running wheel)</td>
<td>Weaning, solo housing (no running wheel)</td>
<td>Solo housing (with running wheel)</td>
<td>(removal of wheel access)</td>
</tr>
<tr>
<td>5-6</td>
<td>8-middle teenage years</td>
<td>4-6 km per day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- **Days 0-21:** Spent with mom (no running wheel)
- **Days 21-28:** Weaning, solo housing (no running wheel)
- **Days 28-42/-70:** Solo housing (with running wheel)
- **1-7 day WL:** (removal of wheel access)

**Key:**
- **4-6 km per day**

**Image:**
- The Wheel lock model is illustrated with graphical representations of different stages and conditions.
The WL model: findings with skeletal muscle

1. Seven days of WL reduces fatty acid oxidation
The WL model: findings with adipose tissue

1. 1-2 days of WL increases visceral fat mass

The WL model: findings with adipose tissue

**Working hypothesis**
Inactivity → initial increase in cell # (attempt to keep adipocytes small and healthy) → eventual increase in adipocyte size

Adipocytes (yellow)
Pre-adipocytes (blue)

↑ IL-6 secretion
↑ MCP-1 secretion
↑ leptin secretion
↓ adiponectin secretion
Studies of Targeted Risk Reduction Interventions through Defined Exercise (STRRIDE) data

- One hundred seventy-five sedentary, overweight men and women were randomly assigned to:
  - 6 mo control group (no exercise)
  - 8 mo walking 12 mi/wk (1.7 mi/d) at 40-55% of peak oxygen consumption
  - 8 mo jogging 12 mi/wk at 65-80% of peak oxygen consumption
  - 8 mo jogging 20 miles/wk (2.9 mi/d)

Studies of Targeted Risk Reduction Interventions through Defined Exercise (STRRIDE) data
# What humans are doing

<table>
<thead>
<tr>
<th>‘Sub-species’ of humans</th>
<th>Weight (lbs)</th>
<th>TEE (kcal)</th>
<th>TEE/REE</th>
<th>Distance traveled (mi and est. steps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modern-day Hunter and Gatherers (Ref 1)</td>
<td>M: 130</td>
<td>~3,300</td>
<td>2.1</td>
<td>Up to 10+ (20,000+ steps)</td>
</tr>
<tr>
<td></td>
<td>F: 90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreational runners (Ref 1 and 3)</td>
<td>M: 160</td>
<td>~2,800</td>
<td>1.7</td>
<td>5-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(10,000-14,000 steps)</td>
</tr>
<tr>
<td>Long-distance runners (Ref 3)</td>
<td>M: 147</td>
<td>~3,500</td>
<td>2.1</td>
<td>10.5+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(20,000+ steps)</td>
</tr>
<tr>
<td>Sedentary office workers (Ref 2 and 3)</td>
<td>M: 200-210</td>
<td>M: 2,000</td>
<td>1.2</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>F: 175-185</td>
<td>F: 1,700</td>
<td></td>
<td>(3,000 steps)</td>
</tr>
</tbody>
</table>

What should humans be doing?

• 30 min per day (~1.5 mi per day + incidental walking)
  – Walking at a ‘modest’ pace (2.5-3.0 mph)
  – There are health benefits (STRRIDE data)

• Accelerometer & 10,000 step paradigm (5 mi per day)

• 45-90 min per day of physical activity for overweight/obese individuals for weight loss maintenance\(^1\)

• Intermittent versus continuous activity
  – 2% weight loss in 30 min/d versus no change in 2x 15 min per day; blood measures of health similarly improved in both groups\(^2\)
  – Ratings of perceived exertion were 1 pt lower in 3x 10 min bouts versus 1x 30 min bout in obese women. Training in general improved health markers\(^3\)

• With children, a range of daily PA may help prevent development of childhood \(\rightarrow\) adulthood obesity

Final Thoughts

• BMI
  – Don’t continue to gain fat, but if you gain a little and have a BMI between 25 and 30 and are active you may be better off than if you had a BMI under 25.
• REE and FFM
  – Yes increasing FFM allows you to burn more calories, but is not a good strategy to burn fat.
• Not all calories are created equal
  – Protein is harder to digest and has fat loss properties compared to carbohydrates and fats. Protein is also needed for muscle repair and growth.
• Fasting is a good strategy to cut out large chunks of calories each week.
  – Eating “all-the-time” is not scientifically reasonable if you are trying to lose weight.
    • But gaining muscle is another story and another lecture
• Physical activity and movement is the key to EVERYTHING
  – Even 2 days without activity can change the way your cells work
• Everyone is different, what works for one does not always work for another.
• You ONLY have control over: Your Thoughts and Your Actions
  – Create your own thoughts using science and facts, don’t take a so-called experts word
The Truth Will Make You FREE, But First It Will Piss You Off.

Gloria Steinem: Women's Rights Activist
Thank you