Exercise to Improve Body Composition

Who doesn't want to look good?
- No matter how you define “good” most of use want to feel good about our appearance.
- In terms of physique this can mean being thin, lean, muscled, ripped, etc.
- So this has to be accepted as a valid goal.
- However, I think you would have a hard time justifying a goal of loosing muscle and decreasing bone density.

Better goals?
- Maintain body mass while increasing, for example, bench press, squat, deadlift strength.
  - (this would require loss of fat and gain in muscle)
- Loose X-lbs of body mass while maintaining strength.
- These types of goals are still focusing on what you would want and are more easily measureable.

Body Comp. Goals
- Being realistic, we would accept goals like.
- Loose body fat
- Maintain (or increase muscle mass)
- As body comp. variables are hard to measure these are tough goals to make SMART.

OK…..now we have our goals
- How do you improve body composition?
- First let us look at some basic physics!
This must be correct in terms of simple physics – use the energy or store it!

But it ‘aint that simple folks!

Still OK in terms of physics…but….

- this approach has led to viewing the variables in the equation (energy in and energy out) as independent variables.

Energy In

- Simpler to estimate but still difficult to be exact.
- Rate of absorption of different foods.
- Amount of fibre in diet.

Traditional Concepts of Unbalancing the Energy Balance Equation

- Decrease Caloric Intake
- Increase Energy Expenditure
- or….combine the above two approaches

Calorie Balance

The Energy-Balance Equation

ENERGY IN
Food calories

ENERGY OUT
Physical activity 10–40%
Food digestion 5–15%
Resting metabolism 55–75%
100 kcal ?! Misleading?
- 20 stalks of celery
- 131 grams of boiled potato
- 4 cups of cabbage
- 4/5 tablespoon (14 grams) of mayonnaise
- 22 grams of Teriyaki steak

So is steak bad?
Not really because it will promote satiety, provide quality protein and will not cause large fluxes in blood sugar…..and consequently may reduce insulin levels.

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**Calculation of Energy Expenditure For Various Activities**

Two methods can be used to determine the amount of energy used or heat produced during an activity.

**Direct Calorimetry**

**Indirect Calorimetry**

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**Basal Metabolic Rate (BMR)**

- The minimum level of energy required to sustain the body’s vital functions.
- BMR depends on:
  - Body size (surface area)
  - Gender (5-10% lower in females)
  - Age (decreases 2-3% per decade after 25)
  - Hormone levels (e.g. Estrogen)
  - Sleep
  - Nutrition
  - Fever & Climate
Set Point Theory

- Fat Cell Size
- Fat Cell Number
- Alterations in the Set Point
- Current thoughts on ideal weight

Physical Activity

- Contributes 20-30 percent of body’s energy output
- Common for energy rate 10 times BMR
- Can slightly increase BMR (effect of hormones, more muscle mass)
- Effects are cumulative

Diets Don’t Work

- 90%+ of people gain the weight back
- low calorie intake lowers the BMR
- yo-yo dieting could be dangerous
- if you can’t do it for the rest of your life -- don’t do it!

Misconceptions Regarding the Role of Exercise in Weight Control

- Exercise Effects on Appetite
- Exercise Effects on Energy Expenditure (too little?)
- Walking versus Running
  - For horizontal walking the net energy cost is approximately 0.75 kcal per kg for every km (0.55 kcal per lb every mile). This figure applies to walking speeds of 2.0-4.0 mph.

Weight (body comp.) Control Myths

- Slow and steady burns more fat
- Only aerobic exercise is good for weight control
- Calories worth more later in the evening
- Spot reduction
- Sweating it off

http://www.exrx.net/FatLoss/Misconceptions.html
Caloric Cost

<table>
<thead>
<tr>
<th>Running Pace</th>
<th>Energy Cost</th>
</tr>
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<tbody>
<tr>
<td>9 min/mile</td>
<td>0.19 kcal/kg.min</td>
</tr>
<tr>
<td>8 min/mile</td>
<td>0.22 kcal/kg.min</td>
</tr>
<tr>
<td>7 min/mile</td>
<td>0.24 kcal/kg.min</td>
</tr>
<tr>
<td>6 min/mile</td>
<td>0.28 kcal/kg.min</td>
</tr>
</tbody>
</table>

1.0 kcal per kg of body weight per kilometre 
(1.0 km = 0.62 miles)

Exercise Intensity

- High intensity exercise and weight loss?
- "Fat-burner classes"?
- Which is best, slow and steady or high intensity?

Another Myth The “Fat Burning Zone” aka “Mythical Training Zones"

![Target Heart Rate Chart]

Target Heart Rate Chart

- Beware the red-line zone! Your heart will explode if you go there!!!!!
- At times I wonder who makes this stuff up… other times I just despair!

CHO and Fat Metabolism during Prolonged Exercise

- While it is true that you use a greater percentage of fat during prolonged exercise (versus short duration high intensity exercise)……….. there is still the issue of intensity and time available.
- If you only have a limited amount of time to exercise (the last graph ranged from 10-90 minutes) then higher intensity may be a better option.

HOWEVER!!
Energy Expenditure in Sports

- Energy expenditure in game situations varies:
  - Skill level and style of player
  - Skill level and style of opponent(s).
  - Intensity of Competition
  - Motivation (psychology) of all players (will they push hard?)
  - Total duration of each rally in sports such as tennis, squash, badminton, and volleyball.
  - Time interval between rallies in such sports.
  - Total duration of entire game.

Simple Logic?

- You have 30 minutes to exercise…does it make sense to you that you should work out at a lower exercise intensity than you are safely capable of, to lose more fat?
- To believe this is to believe burning LESS energy is going to help you loose MORE weight!

Conclusion: more fat (and total calories) is (are) burned at a higher intensity exercise over the same duration.

## VO₂ max. = 2.0 litres/min

<table>
<thead>
<tr>
<th>Exercise Intensity (%VO₂ max)</th>
<th>50%</th>
<th>70%</th>
</tr>
</thead>
<tbody>
<tr>
<td>L/min</td>
<td>1.0</td>
<td>1.4</td>
</tr>
<tr>
<td>kcal/L</td>
<td>4.86</td>
<td>4.90</td>
</tr>
<tr>
<td>Fat kcal/L</td>
<td>2.43</td>
<td>1.96</td>
</tr>
<tr>
<td>kcal/min</td>
<td>4.86</td>
<td>6.86</td>
</tr>
<tr>
<td>kcal/30 min</td>
<td>146</td>
<td>206</td>
</tr>
<tr>
<td>Fat kcal/30 min</td>
<td>73</td>
<td>82</td>
</tr>
</tbody>
</table>

Body Composition of Anaerobic Athletes?

These two athletes work over long anaerobic time frames not just weightlifting.

Body Composition of Elite Specialized Endurance Athletes?

Specialized Athletes and Body Comp

- Hossein Rezazadeh
  - 6’0.5” 359 lbs
  - Clean and Jerk 580 lbs…world record
  - Body comp?

- Just working phosphagen system can be a problem.
The Role of Weight Training and High Intensity Training in Weight Loss

- Follow Weight Management Link from www.ExRx.net
- http://www.exrx.net/FatLoss/WTCalLBWStudy.html
- http://www.exrx.net/FatLoss/DietExStudy.html
- http://www.exrx.net/FatLoss/HIITvsET.html
- http://www.exrx.net/FatLoss/WT%26End.html
- http://www.exrx.net/FatLoss/Tidbits.html

Restricting calories can impair protein turnover


Impact of Exercise Intensity on Body Fatness and Skeletal Muscle Metabolism

- The High Intensity Interval Training group lost over 3 times as much subcutaneous fat as the Endurance Training group despite expending less than half as many Calories (during exercise).
- (20 week program, 17 subjects)
- Fat Loss measured in millimeters
  - Difference of before and after sum of skin fold measurements
  - Sum of skin folds
    - Triceps, Biceps, Calf, Subscapular, Suprailiac, Abdomen

Aerobics to Lose Weight

- A review of the literature suggests in order to achieve significant fat loss with aerobic activity exercise or activity must be performed most days of the week.
  - Progress to at least 45 minutes (60-90 minutes recommended)
- Aerobic exercise should be between 60 to 80% maximum heart rate for progressively longer durations.
  - Higher intensities can be implemented
  - Exercise duration can be decreased
  - Higher intensities have been associated with higher drop out rates for beginners
  - Lower intensities must be continued for longer durations
Increased Post Exercise Metabolism

- Intense exercise (e.g. weight training, HIIT, plyometrics, sprints) can increase metabolic rate for hours after the vigorous workout (3-14 hours: dependent upon intensity).
- The combination of anaerobic and aerobic activity results in faster fat loss than anaerobic or aerobic activity alone.
- Aerobic exercise burns fat during exercise, but has little effect afterwards.
- Exercise (particularly weight training) develops muscle, restores muscle that had been lost due to years of a sedentary modern lifestyle.
- While increased muscle mass **does not** increase resting metabolism by much, it may keep you active throughout the day (less fatigue) and hence you do in effect burn more calories.

Quantity and Quality

- I have argued the quality of the food you eat (refined CHO being a huge problem) will affect the energy balance equation.
- But obviously one must also accept quantity is still a variable to be controlled.
- Similarly, I have argued quality of exercise is very important.
- And yet again total exercise volume is still a factor.

Weight Control Programming

- Maintain Energy Balance
- Maintain Nutrient Balance
- Maintain Carbo/Protein/Fat Balance
- More on that later
- Good Meal Frequency (≥3)
- ”Little and often”
- Variety in Food Selection
- Common Foods
- Gradual Weight Loss (if required)
- Balanced Exercise Program (ideally aerobic, anaerobic and weight training)

Weight Gain Programs

- Strength Training Required! Unless you want to increase fat!!!
- Consume More Energy (probably some increase in protein)
  - Needed = 1g/kg/day
  - N.A. Average 1.4g/kg/day
  - Heavy resistance 2-2.6g/kg/day
- “Protein Timing” – to be discussed later.
- Realistic Goals?
- Avoid steroids, single amino-acids, creatine monohydrate (no research that CM is a big health risk?), etc.