The Truth Revealed: The Physiology of Fitness and Obesity

Shavon L. Arline, MPH
Certified Personal Trainer
Fitness Specialist
Nat’l Recreation & Park Association
True or False??

- Working out allows me to eat whatever I want. T/F
- Muscle weighs more than fat. T/F
- No pain, no gain. T/F
True or False??

I must stop eating to lose weight.
T/F

Spot Reducing Works (i.e. 6-pack from stomach crunches) T/F

Diet Pills Work T/F
The *Real Meaning* of Exercise

**Exercise**

- Physical activity that is planned and structured.

- Repetitive bodily movement to improve/maintain one or more components of physical fitness.
Components of Fitness

“Cardio” Respiratory Training
- Aerobic and Anaerobic Activity

Muscular Strength/Endurance
- Eccentric – Elongation
- Concentric – Bicep Curls
- Isometric – Wall Sits

Flexibility
F.I.T Model and Physical Activity Guidelines

**Frequency:** How Often?

- **2 ½ hours** per week of moderate intensity (5 days per week/ 30 minutes of activity)

- Not Sufficient for “High Performance”

- **1 hour and 15 minutes** per week of vigorous physical activity
F.I.T Model and Physical Activity Guidelines

**Intensity:** How Hard?
- Metabolic Equivalent – MET
- Body at Rest Vs. Body at Work

**Time:** How Long?
- Duration of activities like walking, jogging, dancing, basketball, football
- Moderate Intensity – 30 min.
- Vigorous Intensity- 20 min. +
Exercise Physiology Facts

Heart Rate Maximum
- Karvonen Formula
  - 220 – Age = Maximum Heart Rate
  - Shavon’s Heart Rate Maximum = 190 bpm

Basal Metabolic Rate (BMR)
- The minimum amount of energy expenditure required to carry on normal biological functions
- BMR per day = 1 Calorie x weight (lbs)/ 2.2 x 24
What Your Muscles Need for Fitness

**Adenosine TriPhosphate (ATP)**
- Powers skeletal muscle
- First 5 or 6 seconds of muscle power

**Creatine Phosphate**
- Available to cells, rapidly produces ATP
- 10-15 seconds of muscle power provided through the body’s use of phosphagen system
What Your Muscles Need for Fitness

**Glycogen Lactic Acid System**
- For another 30-40 sec of energy
- Burning in your muscles
- Track and Field (400 meter races)

**Aerobic system**
- Provides energy that is limited by the body's ability to supply oxygen/nutrients
- Long runs, soccer games, basketball, football
“Native” Athletes Using Their Muscle Systems
Food for Fitness.. and ATP

Fat

- Adipose tissue throughout the body, energy reservoir

- Energy release is too slow for very intense activity
Food for Fitness.. and ATP

Carbohydrates

- At rest, carbohydrate is taken up by the muscles and liver and converted into glycogen.

- Heavy training session can deplete carbohydrate stores in muscles and liver.
Food for Fitness.. and ATP

**Protein**

- Source of energy, particularly during prolonged activity
- Broken down into amino acids before then being converted into glucose
- Protein cannot supply energy at the same rate as carbohydrate.
Supplements: Good, Bad, Ugly

**Creatine**
- Short term, high intensity activity will last longer = greater load on your body
- Requires *increase in water consumption*, can cause unwanted weight gain and side effects.

**Sports Drink**
- Replenish electrolytes during activity
- High sugar content and caloric intake
Supplements: Good, Bad, Ugly

**Steroids**

- Increase in testosterone hormone provides increase in ability to perform Work (high level fitness)

- Side affects: females lose breast tissue and fat mass, males can become sterile

- Death!!!!
Fitness and French Fries?

20 Years Ago

210 Calories
2.4 ounces

Today

610 Calories
6.9 ounces

Calorie Difference: 400 Calories

How to burn* 400 calories:

Walk 2 hours 20 minutes

*Based on 130-lb person.
Obesity...The “Buzz” Word

**Obesity**
- Excess storage of energy (\(E\)) in the form fat (Excess body fat versus body weight)

**Body Composition**
- Used to determine if an individual is overweight or obese

**Body Mass Index**
- Tool for indicating weight status and correlates with body fat.
- \(\text{BMI} = \frac{\text{weight (kg)}}{\text{height}^2 \text{ (cm)}}\)
Hyperplastic Obesity
  - Classification of obesity in which individuals have a greater number of fat cells which are also larger than normal.

Hypertrophic Obesity
  - Caused by a normal number of cells have increased in size.
  - Most common form of obesity.
Physiology of Obesity

Gynoid
- Fat storage in the hips
- Fat storage in the thighs

Android
- Fat storage in the abdomen
Android (Apple) vs. Gynoid (Pear) Obesity

A Tribute to a Pioneer:
Jean Vague (1947)

Gender and Obesity

**Gynoid Obesity**
- most common form of obesity in women

**Female Disadvantage-Obesity Affecting Metabolic Rates (Gleim et al, 1993)**
- Moderate exercise alone may not be enough to affect body composition
- Disadvantage: elevating/maintaining RMR b/c of smaller body size, differences in body fat, and lower aerobic capacity.
Energy Equation: Law of Thermodynamics Applied to Obesity

\[ E_{\text{in (food)}} = E_{\text{out (work)}} + E_{\text{out (heat)}} +/-(E_{\text{stored (fat)}}) \]

- Food Consumed \( E \), heat released as chemical \( E \), \( E \) stored for later use

Energy is neither created or destroyed

- Reduce (food intake) left side of equation and increase right side. (exercise)
Thermodynamics

When diet plans make claim about rapid weight loss *WITHOUT* exercise or special food choices, remember Energy is neither created or destroyed”
Barriers to Wellness

Jack in the Box
*Bacon Ultimate Cheeseburger*
- 1020 calories
- 71 grams of fat

Average American teens watches 3-4 hours of TV/media per day
20 Years Ago

140 calories
3-inch diameter

Today

350 calories
6-inch diameter

Calorie Difference: 210 calories
Strategies to Overcome Barriers to Wellness

- Understand BMI, lean body mass vs. scale
- Access Health Care: Regular Check ups, physical!
- Refrain from the use of drugs and alcohol
- Increase Physical Activity, make it a part of your life = YOU WILL FELL BETTER!!
  - Endorphins
  - Healthy Weight
  - High Self Esteem
Strategies to Overcome Barriers

Access Nutritious Foods and Maintain Healthy Eating Habits

- Fruits and Vegetables
- Lean cut meats: grilled chicken, fish, turkey
- Whole Grains: “BROWN on DOWN”
- Healthy Snacks: granola, yogurt, air popcorn, unsalted pretzels
Healthy Teens!!

- Education
- Prevention
- **PERSONAL ACCOUNTABILITY**
  - “It’s Up To You”
Resources

“Racial Differences in Cardiovascular Health”. Pfizer Global Pharmaceuticals: 2003


www.cdc.gov (division of nutrition and physical activity)

www.nhlbi.nih.gov/about/oei/index.htm

www.hp2010.nhlbinih.net

www.Blackwomenshealth.org
Resources


Contact Information

Shavon L. Arline, MPH

804-863-1652 x250

www.shavonarline.com