

The Female Training Advantages

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Recommended Reading: **Fatigue Resistance: An Intriguing Difference in Gender** (Len's WEB page)

I. Benefits of resistance training for women

- A. Increase in bone mineral density, increase in fat-free mass, increase in muscular strength and muscular endurance, increase in glucose metabolism (insulin sensitivity)
- B. Increase in HDL-C (some studies), altered total cholesterol and LDL-C (some studies), RMR (slightly), increase in psychological well-being
- C. Exercise and insulin sensitivity (aerobic and resistance exercise): the number and availability of insulin receptors increases (increases sensitivity to insulin)

II. Resistance training excels

- A. 2000—24.8 million adults; 2006—32.9 million adults
- B. Growth: 1972 passage of Title IX, 1972—300,000 women in sport; 1998—2.2 million women in sports; 2006—51.8 million women exercise walking

III. Factors affecting performance: Morphology (structure)

- A. > 50 trillion cells in human body and reproductive cells are how sexes differ
- B. Males have 10-30x more testosterone; organ size is related to person's size and not gender
- C. Males exhibit greater height and wider shoulders
- D. Females exhibit wider hips and more subcutaneous body fat (men more visceral fat)
- E. Females in general are 3-4 inches shorter and 25-30 lbs lighter than males
- F. What two joints in the female are wider than in male? (knee and hips)
- G. 'True pelvis' is larger to accommodate fetus
- H. Females have greater lumbar (anterior) spinal curvature due to 'true pelvis' which often leads to more chronic low back pain (Core training needs to be staple in training females!)
- I. A 'Q' angle > 15 degrees predisposes females to patella problems such as chondromalacia and to anterior cruciate ligament (ACL) injuries, 1 in four injuries is knee, women more susceptible to 'runners knee', 2-8 times more likely to have an ACL injury
- J. Injury prevention suggestions:
 - 1. Multi-mode training to offer varied stimulus challenge while avoiding overuse
 - 2. Matrix lunges: forward, 45 degree forward, side, 45 degree back, back lunge
 - 3. Squat variations: narrow, shoulder width, wide, 'summo'
 - 4. Platform stationary lunges
 - 5. Agility drills (side to side single leg movements, hopping side to side)
- K. Women have 8%-10% more body fat; 5% is sex-specific to females (reproduction)
- L. Elite endurance male and female athletes vary 2%-6% in body fat
- M. Body composition swimming training advantage
 - 1. Body fat aids in buoyancy, females have less 'drag' in water
 - 2. Expend 20% less energy (at same pace and distance as male counterpart)

- N. What % does skeletal muscle comprise of total body weight in females? (31%)
- O. What % does skeletal muscle comprise of total body weight in males? (38%)
- P. Morphological summary: at full maturity average females is ~3"-5" shorter (shorter limbs), and ~25-30 lb lighter
- Q. Average body fat for females is 23% as compared to 16% for males (non-athletes)
- R. Women predominantly store fat in the subcutaneous area
- S. Applications: lighter body frame, running/jumping mechanics, endurance training (increase in %BF), shorter levers, importance or core training: A woman can increase fat-free mass with resistance training and lower subcutaneous fat and have no change in body weight
- T. How much does strength decline due to aging and inactivity? 8-10% per decade (4th decade)
- U. Are physically active women healthier than sedentary women (9,704 females, ≥ 65 yrs)
- V. Results: sedentary women who increased their physical activity equivalent to 1 mile/day brisk walking at a 40% to 50% lower risk to CVD, cancer and all causes of mortality

IV. Fat metabolism and aerobic exercise program design

- A. Fat mobilization is the releasing of fat from storage depots
- B. Epinephrine stimulates mobilization and lipolysis (splitting of fat)
- C. Estrogen enhances epinephrine production
- D. Estrogen inhibits lipoprotein lipase (LPL)
- E. Estrogen stimulates growth hormone (GH) production: GH enhances fatty acid metabolism and inhibits glucose metabolism
- F. Why is there a difference in fat distribution in males and females
 1. Fat cells have epinephrine receptors
 2. Alpha receptors inhibit lipolysis; beta receptors stimulate lipolysis
 3. Women have more alpha receptors in hips/thighs
 4. Women have more lipoprotein lipase (LPL) in the hips and thighs (LPL deposits fat)
- G. Respiratory Exchange Ratio (RER) is the volume of carbon dioxide (CO₂) expired in relation to the volume of oxygen (O₂) inspired: it reflects what fuels utilized in exercise
- H. Is there a gender difference in fat utilization: BIG DEBATE! Most recent research conclude that YES, a gender difference exists in the relative contribution from carbohydrate and lipids
- I. Designing aerobic programs to enhance fat metabolism
 1. Incorporate low-to-moderate int., long-duration workouts (increase metabolic base)
 2. Incorporate FAST continuous training (increase total fat metabolism)
 3. Incorporate interval training (more work = increased total fat metabolism)
- J. Lactate threshold design (for fat metabolism); Monitor with RPE and Talk Test: Case study of client who is doing 200 minutes of Cardio Training in a week
 1. 80% of total should be low-to-moderate int. exercise: 160 minutes, so perhaps four, 40 minute workouts {RPE 11-13}; Talk test=easily cite "Pledge of Allegiance"

2. 10% of total should be Fast Continuous; perhaps one 20 minute workout {RPE 14-15}; Talk test=cite “Pledge of Allegiance” with difficulty
3. 10% of total should be Interval Training, perhaps one 20 minute workout {RPE 16-17}; Talk test= cannot cite “Pledge of Allegiance”
4. Individualize the progression: incremental increased in volume and intensity: try to avoid injury, overuse and overtraining to the client

V. Fatigue resistance: Resistance training design

- A. Females have much greater ‘fatigue resistance’ than males
- B. Declines as intensity increases; no difference at $\geq 80\%$ of 1RM: WHY?
- C. Lower absolute muscle mass, lower muscle oxygen demand, increased oxygen extraction and waste clearance, estrogen increases blood flow to working muscle, increased neuromuscular activation after fatiguing exercise
- D. Fatigue resistance training implications: Fit females capable of more high volume (reps x sets) workouts, fit females require less recover time between sets (60 sec.); fit females need fewer rest days between intense ($\geq 80\%$ 1RM) workouts
- E. What training systems are recommended (from the published research): Periodization
- F. Systematic changes of volume and intensity with variation manipulation
- G. Volume=reps x sets; intensity=%1RM

Undulating Approach (Marx et al. study): Young women average age 22 years; 6 month study; Results Indicated:

No change in body mass, body fat (26.5% to 19.8%), fat-free mass (42.3 kg to 45.6 kg), bench press improved 50%, wingate power improved 27%, speed improved 6%, testosterone and Insulin growth factor-1 increased (anabolic hormones), no change in human growth hormone, cortisol levels decreased

Program (3 day/wk): Total body workout each day; 2-4 sets, within week variation of exercises

Option 1: Monday (all sets done in 12-15 RM zone), Wednesday (all sets done in 8-10 RM zone), Friday (all sets done in 3-5 RM zone); note that every 2-3 weeks the program rotated as follows in Option 2

Option 2: Monday (all sets done in 3-5 RM zone), Wednesday (all sets done in 8-10 RM zone), Friday all sets done in 12-15 RM zone)

Three other weekly (MWF) sequence options by rep zones: (a=8-10 RM, 3-5 RM, 12-15 RM; b=3-5 RM, 12-15 RM, 8-10 RM; c=12-15 RM, 3-5 RM, 8-10 RM)

Two-Day Linear Periodization (Roepstorff et al. study): Total body workout each day with untrained middle-aged women (52 yrs) and mature women (64 yrs). Results indicated: Significant increases in maximal and explosive strength characteristics of lower body,

improved walking speed, improvement in static and dynamic balance capabilities in this 21 week study.

52yr grp: increase in isometric strength (28%), dynamic strength (20%) & dynamic balance (31%)

64yr grp: increase in isometric strength (27%), dynamic strength (20%) & dynamic balance (18%)

Program (2 day/wk): Total body workout each day

First 7 weeks: 2-4 sets of 10 total body exercises:

Day 1 of week 40-60% 1RM (10-15 reps); Day 2 of week 60-70% of 1RM (8-10 reps)

PLUS: 1 Set (8-12 Reps) at 50% 1RM of explosive leg press, leg extension, hamstring curl

Second 7 weeks: 2-4 sets of 10 total body exercises:

Day 1 of week 60-70% 1RM (10-12 reps); Day 2 of week 70-80% of 1RM (5-8 reps)

PLUS: 1 Set (8-12 Reps) at 50% 1RM of explosive leg press, leg extension, hamstring curl

Third 7 weeks: 3-5 sets of 10 total body exercises:

Day 1 of week 70-80% 1RM (8-10 reps); Day 2 of week 70-80% of 1RM (5-8 reps)

PLUS: 1 Set (8-12 Reps) at 50% 1RM of explosive leg press, leg extension, hamstring curl

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