

Exercise for Special Populations

Metabolic Problems
Pregnancy
Advancing Age

Outline

- Exercise and metabolic problems
 - Obesity
 - Diabetes – Type I and Type II
- Exercise during pregnancy
- Exercise in advancing age

Obesity Facts from Centers for Disease Control

- Sixty-four percent of U.S. Adults are overweight or obese. **(1999-2000)**
- Twenty-three percent of U.S. Adults are obese (BMI greater than or equal to 30.0). **(1999-2000)**
- Percent of Adolescents (ages 12-19) Who Are Overweight: **15% (1999-2000)**
- Percent of Children (ages 6-11) Who Are Overweight: **15% (1999-2000)**

Exercise and Obesity

- Emphasize duration, lower intensity initially
 - Increased in 1-minute increments
- Exercise goal
 - Increase energy expenditure (~300 Kcal/day)
 - Improve cardiovascular fitness



Exercise and Obesity

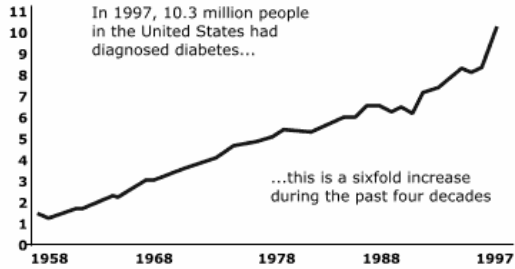
- Dietary and behavioral intervention may be (probably is) necessary
- Limitations
 - Avoid hot/humid environments
 - Lack of balance, flexibility
 - Excess weight can increase chance of musculoskeletal injury



Exercise and Diabetes

- What is diabetes mellitus?
- A metabolic disorder characterized by high blood glucose levels (inability to regulate blood sugar)
- Symptoms: Triad
 - Polyuria (frequent urination)
 - Polydypsia (excessive thirst)
 - Polyphagia (excessive hunger/eating)
 - And, glucosuria (glucose present in urine)

Number of People in the United States with Diagnosed Diabetes



Source: American Diabetes Association

Two Types of Diabetes – Type I

- Type I diabetes
 - Insulin-dependent diabetes mellitus (IDDM)
 - Juvenile onset
 - Less common form (~10% of cases)
 - Inability of pancreas to produce insulin
 - NOT linked to obesity
 - Must be treated by insulin

Two Types of Diabetes – Type II

- Type II Diabetes
 - Non insulin-dependent diabetes mellitus (NIDDM)
 - “Adult onset” (but becoming more common among children)
 - More common form (~90% of cases)
 - Insulin insensitivity – NOT a true lack of insulin
 - Sometimes can be treated by exercise and diet, sometimes also requires supplemental medication or insulin
 - Strongly linked to obesity, genetics

- Type II diabetes is not only for the adult population anymore
- AZ Republic, 11/4/02
- 13 yr old, 5'4" and weighs 211 lbs.



Diabetes: *Exercise Training*

- Exercise training
 - Improved glucose control
 - Improved insulin sensitivity
 - Body fat reduction
 - Decreased risk of cardiovascular disease
 - Stress reduction – as a means to improve regulatory hormones

Exercise and Type I Diabetes

- Consultation with a physician necessary
- Eat 1-3 hours before exercise, eat a carbohydrate snack after exercise
- Insulin dose may need to be adjusted to accommodate exercise
- Keep a regular schedule or pattern
- Monitor blood glucose frequently, including during exercise
- Generally, all sorts of exercise & sports activities are OK, with caution and careful planning
- Neuropathy is a big issue with both Type I and Type II diabetics (i.e.

Exercise and Type II Diabetes

- In general, we recommend a lot of the same recommendations for Type II diabetics. However, the major difference is that Type II diabetics tend to be overweight.
 - Medications and/ or insulin relative to exercise
 - Small, frequent meals throughout the day
 - Regularity
 - May need physician supervision and/ or referral
- Exercise decreases the insulin insensitivity and can lower or eliminate the need for insulin supplementation
- Exercise is good for weight reduction
- Emphasize duration and frequency of exercise (as with obesity)
- Intensity can be fairly low (40-60% of VO₂max)

Special Precautions in those with Diabetes

- Peripheral Neuropathy –
 - The patient must check feet before and after exercise
 - Wear proper shoes (may require special orthotic inserts)
 - Positional hypotension – i.e. the body doesn't respond as quickly to positional changes
- Some medications may mask feelings of hypoglycemia (i.e. need to check glucose before and after exercise)
- Medical I.D. tag – especially if they will be exercising on their own

Exercise and Pregnancy - Concerns

- Safety concerns – for mother
 - Musculoskeletal injury due to altered posture & center of gravity, and joint laxity (extra flexibility) caused by the hormone relaxin
- Safety concerns – for baby
 - Hyperthermia – fetus relies on mother for heat loss so mother should not overheat
 - Reduced uterine blood flow (due to high muscle blood flow) could cause low oxygen delivery, low nutrient delivery and ultimately low birth weight
 - Cord entanglement, acceleration/decel impact trauma
 - Increased risk of miscarriage or premature labor

Exercise and Pregnancy - Recommendations

■ Recommendations for low intensity exercise

1. OK to start or continue program of low intensity exercise
2. Very low risk to mother and fetus
3. Some potential health benefits such as reduced insulin resistance, increased fitness, higher self-esteem
4. Water activities (no impact) may be a good choice
5. Avoid activities with high risk of abdominal impact, especially in third trimester



Exercise and Pregnancy - Recommendations

■ Recommendations, High Intensity

1. Exercise at intensities greater than 50% of VO₂max can be maintained during pregnancy (the 140 bpm rule is outdated)
2. Maximum work load will (in almost all cases) fall
3. If continued through third trimester, birth weight will be reduced (average ~300g) and gestation length will be reduced by ~ 5 days
4. Some research suggests shorter labor, reduced incidence of c-section
5. Hyperthermia and dehydration must be avoided

Exercise and Pregnancy - Recommendations

High Intensity Exercise - Continued

6. Pain, hemorrhage, persistent uterine contractions, lightheadedness, complications of pregnancy are all reasons to reduce intensity/stop exercise
7. Caloric requirements of pregnancy vary with month and individual, but caloric intake must take exercise expenditure into account
8. Very high altitudes ($\geq 3,000$ m) and SCUBA should be avoided
9. Post-partum exercise should be limited to low intensities to prevent complications

Exercise and Aging

- Physiological changes
 - Slow, progressive decline in $\text{VO}_{2\text{max}}$
 - Decrease in max HR (estimate: $220 - \text{age}$)
 - Slow, progressive loss of muscle mass
 - Slow decline in basal metabolic rate
 - May be loss of bone mass

Figure 12.1 The decline in $\text{VO}_{2\text{max}}$ with age.

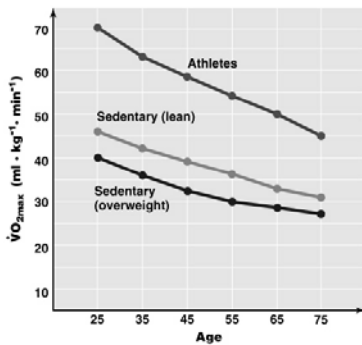
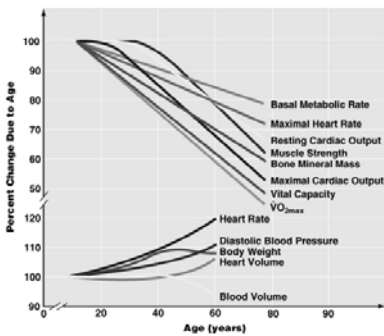


Figure 12.2 Physiological changes with an increase in age.



Exercise and Aging - Recommendations

- A stress test may be recommended before an exercise program is started (to screen for heart problems)
- Risk of musculoskeletal injury may be higher (esp. with loss of strength and flexibility) so low or no impact activities are recommended
- A lower frequency of exercise (3-4 days/wk) may reduce injury risk by increasing time for recovery between exercise bouts
- Otherwise, the same principles as discussed in Ch's 4 & 5 apply and the same % gains as in younger people can be expected.

Summary

- Obese individuals should emphasize duration and increasing voluntary energy expenditure.
- Type I diabetics must learn to manage blood glucose during exercise.
- Exercise duration is the key difference between exercise for type I and type II diabetics.

Summary

- Pregnancy should not prevent women engaging in low-moderate intensity exercise.
- Aging causes a slow, progressive decline in some biological functions but exercise is still beneficial
