Physical Activity and Diabetes-Individual Approaches

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Definitions

- Physical Activity
  - Movement caused by skeletal muscle contraction

- Exercise
  - Physical activity aimed at increasing physical fitness

- Physical Fitness
  - Relates to ability to perform physical activity
Exercise to Improve Physical Fitness

- **Type**: Continuous, rhythmic prolonged activity using the large muscle groups of the legs and/or arms
- **Intensity**: vigorous
- **Duration**: 20 – 60 minutes per session
- **Frequency**: At least 3 days per week
- **Progression**: Allow 4-6 weeks for initial improvement
The Exercise Session

- **Warm-up**
  - Low intensity aerobic activity

- **Main Exercise**
  - Moderate to vigorous
  - Aerobic and/or resistance exercise

- **Cool-down**
  - Low intensity aerobic activity
  - Gentle stretching
Guidelines Galore

- Report of the Surgeon General/CDC/ACSM
  - Physical Activity and Health – 1996
- Institute of Medicine
  - Dietary Guidelines– 2002
- USDA and HHS
  - Dietary Guidelines for Americans - 2005
CDC/ACSM Guidelines - 1996

- Traditional, structured exercise program of moderate to vigorous activity for at least 30 minutes on 3 or more days per week, or

- Accumulate at least 30 minutes of moderate intensity physical activity on most, if not all, days of the week.
Meeting CDC/ACSM Guidelines

- Initially, increase daily activity
  - Stairs, park further away, more housework
- Walking
  - Continuous activity
  - Two 15-minute segments
  - Three 10-minute segments
  - Accumulate at least 150 minutes of moderate intensity physical activity each week
# Rating of Perceived Exertion

<table>
<thead>
<tr>
<th>Intensity</th>
<th>RPE</th>
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</thead>
<tbody>
<tr>
<td>Very Light</td>
<td>&lt;10</td>
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<tr>
<td>Light</td>
<td>10-11</td>
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<tr>
<td><strong>Moderate</strong></td>
<td>12-13</td>
</tr>
<tr>
<td>Hard</td>
<td>14-16</td>
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<tr>
<td>Very Hard</td>
<td>17-19</td>
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<tr>
<td>Maximal</td>
<td>20</td>
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Institute of Medicine Guidelines - 2002

- Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fatty Acids, Cholesterol, Protein, and Amino Acids

- Physical activity recommendation is to achieve a total of at least one hour of moderately intense physical activity each day in order to prevent weight gain
Meeting IOM Guidelines

- Twice as much activity as that recommended in Healthy People 2010
- Focus is on prevention of weight gain
- Address the issue of dose-response to physical activity
  - Greater intensity and duration physical activity generally provides greater benefits, particularly in regard to weight
Dietary Guidelines for Americans – 2005 (HHS/USDA)

- Provide science-based advice to promote health and reduce risk for major chronic diseases through diet and physical activity
- Cite imbalance between diet and physical activity as a major contributor to obesity
- Participate in 60-90 minutes of daily moderate to vigorous activity to cause and sustain weight loss
Meeting HHS/USDA Guidelines

- Three times as much activity as that recommended in Healthy People 2010
- Focus is on weight loss and its maintenance
- Additional focus is on improving physical fitness by including cardiovascular conditioning, resistance exercises and flexibility exercises
Summary of the Guidelines

- For overall well-being: 30 min/day
- To prevent weight gain: 60 min/day
- To sustain weight loss: 90 min/day
- To improve physical fitness: More vigorous activity for 20-60 min on 3-5 days per week
Pre-Exercise Evaluation

- Medical History and Physical Exam
  - Heart and blood vessels
  - Eyes
  - Kidneys
  - Nervous system

- Screen for macro- and microvascular complications that may be worsened by exercise
Complications that warrant increased vigilance

- Nephropathy
  - No evidence of exercise-induced kidney damage

- Autonomic Neuropathy
  - Increase awareness of blood pressure, foot care and thermoregulatory responses

- Retinopathy
  - No evidence of exercise-induced progression
Other Things to be Aware of

- Monitoring of blood glucose
  - Know signs and symptoms of hypoglycemia
- Feet
  - Shoe cushioning/blister monitoring
- Identification
  - ID bracelet or shoe tag
- Good hydration
  - Throughout the day
Changing Physical Activity Behaviors

- Replace sedentary pursuits with active ones
  - Take the stairs
  - Park at the end of the lot

- Re-orient life to include physical activity
  - Arrange to meet a friend for a walk rather than lunch
  - Take children for a nature hike instead of sitting while they play on a playground
Mediators of Physical Activity

- Self-confidence
- Social Support
- Benefit/Barrier Ratio
- Use of Behavioral Processes
- Outcome Expectations

- *Motivating People to Be Physically Active.*
  Bess Marcus & LeighAnn Forsyth, 2003
Benefits of Physical Activity

- Improves glucose utilization
- Improves sensitivity to insulin
- Reduces blood pressure
- Improves lipid profile
- Helps control body weight and body fat
- Reduces stress and improves mood
Barriers to Physical Activity

- Lack of time
  - Work/school
  - Household duties
  - Children’s needs
  - Social commitments
- Lack of support
  - Family or friends
  - No activity partner
- Lack of interest
- Lack of facilities
  - Weather problems
  - Seasonal problems
- Safety concerns
  - Personal
  - Environmental
Outcome Expectations

- **Personal expectations**
  - Feeling energized
  - Stress reduction
  - Increased enjoyment

- **Clinical expectations**
  - Glucose control
  - Blood pressure
  - Lipids
  - Weight loss
Glucose Control

- Muscle contraction exerts an insulin-like effect on glucose transport that results in enhanced muscle glucose use
- Increased insulin sensitivity for 12-14 hours after an activity session
- Related to the size of the muscle mass involved and the duration of activity
Effects on HbA1c

- Expect improvements without normalization of body weight or body fat
- Reduction in HbA1c appears to be dose-related
Physical Activity to Improve Glucose Tolerance

- Regular moderate activity
- Accumulate ≥ 150 minutes each week
- Use multiple muscle groups
- Consider some resistance exercise
- Can safely be encouraged without extensive medical or physical fitness testing
Physical Activity to Improve Blood Pressure

- **Frequency**: on most, preferably all days
- **Intensity**: moderate
- **Time**: 30 minutes or more (accumulated or continuous)
- **Type**: continuous, rhythmical
- **Dose-response not evident**
Expected Benefits for Hypertensive Individuals

- Post-exercise reduction in blood pressure lasting as many as 10 hrs
- Average reductions in SBP = 7 mmHg
- Average reductions in DBP = 6 mmHg
Effects on Lipids

- Exercise in combination with weight loss decreases LDL-C (particularly VLDL) and limits reduction of HDL-C seen with a low fat diet
- Magnitude of the exercise effect
  - Specifics of the exercise intervention
  - Individual variation
  - Weight change
Physical Activity to Improve Lipids

- Consider emphasizing weight loss
- Consider more than 30 minutes of physical activity on some days
- Consider more vigorous exercise on one or more days/week with appropriate screening before beginning program
Weight Control or Loss

- Goal is to burn the same or more Calories that you eat
- Needs to be done in conjunction with a good diet plan
- Create a 500 to 1000 kcal/day energy deficit by combining diet and exercise
National Weight Control Registry

- Average weight loss of 66 lbs maintained for an average of 5.5 years
- Reported calories/week from physical activity
  - Women = 2445 kcals/wk
  - Men = 3298 kcals/wk
- Activities included walking, cycling, aerobics, stair climbing
Physical Activity for Weight Loss or Control

- Decrease sedentary time
- Prolonged moderate intensity activity is best (e.g., long walks, bicycling, etc.)
- Adding some resistance exercise may maximize fat loss and prevent decreases in resting energy expenditure
Bottom Line

- The majority of health benefits have been attributed to a shift from inactivity to a moderate amount of activity.
- Physical activity can be accumulated in 10 minute increments.
- Expected health outcomes may differ with differing types and amounts of activity.