Harnessing the Power of Exercise to Prevent Type-2 Diabetes

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Program Overview

- T2D Risks Factors
- Physical Activity Benefits
- Increasing General Daily Activity
- Designing an Exercise Prescription
- Practice!

Risk Factors for T2D

- Overweight/obesity
- Age 45 or older
- Family history of diabetes
- African American, Native American, Asian American, Hispanic, Pacific Islander
- Hypertension
- Low HDL or High triglycerides
- History of GDM (or baby weighing ≥ 9 lbs)
- Low levels of physical activity
- PCOS
- History of heart disease or stroke
- History of depression
- Acanthosis nigricans

Source: NIDDK, US Dept of Health & Human Services
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The Root Cause of Type-2 Diabetes is INSULIN RESISTANCE

How Is Insulin Sensitivity Enhanced by Physical Activity?
### Amazing Medicine

**Health Concern** | **Effect of Physical Activity**
--- | ---
Insulin Resistance | • Insulin Sensitivity  
• Receptor Proliferation  
• GLUT-4 Transport*  
• Slower CHO Absorption  
• Glucose Utilization  
• Accelerated insulin action  
• Acute & Chronic Reduction  

Postprandial Hypoglycemia: Need for Insulin/Meds


### Amazing Medicine

**Health Concern** | **Effect of Physical Activity**
--- | ---
Heart Disease | • Collateral Circulation  
• Atherosclerosis  
• LDL, HDL  
• Triglycerides  
• Diastolic BP  
• Calorie Burning  
• Metabolism  
• Appetite Suppression*

Blood Lipids

Hypertension

Obesity

### Amazing Medicine

<table>
<thead>
<tr>
<th>Health Concern</th>
<th>Effect of Physical Activity</th>
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<tbody>
<tr>
<td>Disuse Syndrome/Adhesive Capsulitis</td>
<td>Conditioning Gains</td>
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<tr>
<td></td>
<td>Flexibility/ROM</td>
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<tr>
<td></td>
<td>Work Capacity</td>
</tr>
<tr>
<td>Stress</td>
<td>Tension Release</td>
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<tr>
<td>Depression</td>
<td>Self-Control, Pride</td>
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<td>Pain</td>
<td>Endorphin Production</td>
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### Activity Recommendations

- **Diabetes Prevention Program**: 150 minutes/week of moderately intense activity for prevention of diabetes
- **ACSM**: 30 minutes, 5 days/week of moderately intense activity and 2 to 3 days of resistance training a week for cardiovascular health
- **Look AHEAD**: 175 minutes/week of moderately intense activity increased gradually to 200 minutes

### Recommendations for Activity

National Weight Control Registry: 90% of members engage in daily physical activity for an average of 60 to 75 minutes at a moderate level of intensity
Avg 11,000 to 12,000 steps a day:

- Wyatt HR et al. Lessons from patients who have successfully maintained weight loss. Obesity Management. April 2005: 36 to 41
Percentage reduction in initial weight at 1 year based on quartile of average weekly minutes of self-reported physical activity. The number within each bar shows the mean number of minutes per week spent in physical activity. The value above each bar indicates the % weight loss at 1 year.

Haddad et al. One Year Weight Loss in the Look AHEAD Study: Factors Associated with Success. (Glanz 2009; 17:159-172)

The Value of General Daily Activity

- Burns Calories
- Maintains Functional Capacity
- Raises Metabolism
- Instills an “Attitude”

General Daily Activity

- Ideas for Increasing Walking
  (Consider using a pedometer or phone app for step counts!)
  - Walk while talking on phone
  - When meeting with friends, walk rather than sitting
  - Take 1-2 flights of stairs instead of elevators & escalators
  - Walk (rather than drive) to errands near home
General Daily Activity

- Ideas for Increasing Walking
  - Walk on moving walkways rather than standing
  - Search out the furthest parking spots
  - Go down every aisle in grocery stores
  - Get a dog and walk him two or three times a day
  - Walk slowly on a treadmill while watching TV

General Daily Activity

- Other ideas for increasing energy expenditure
  - Do your own gardening and yard work
  - Do your own house work
  - Go out on “active” dates: dancing, bowling, skating, mini golf
  - Ride a bike to complete local errands

General Daily Activity

- Other ideas for increasing energy expenditure
  - Hide the remote! Change channels manually
  - Take up carpentry or sculpting
  - Practice yoga, pilates or Tai-Chi
  - Take dance lessons
**“Exercise” vs Work/Leisure Activity**

- **“Exercise”**
  - Challenging, Uses Large Muscle Groups, Rhythmic or Continuous, Over a Period of Time
  - Significant conditioning, strengthening, metabolic benefits

- **Work/Leisure Activity**
  - Often discontinuous, varied intensity, less challenging
  - May not be very challenging
  - Still provides benefits!

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**Effectiveness of Physical Activity Advice and Prescription by Physicians in Primary Care**


- Randomized
- Controlled
- Multi-Center
- Blinded Analysis

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**Effectiveness of Physical Activity Advice and Prescription by Physicians in Primary Care**

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<tr>
<th>Control</th>
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<th>Advice + Prescription</th>
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- Provider Training
- Used Web software re: benefits, risks, general activity suggestions
- Summary pamphlet
- Same as advice group, +
- Goal setting
- Barriers addressed
- 3-month Plan
- Printed exercise Rx (mode, freq., duration, intensity, progression)
- Self-monitoring log

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Effectiveness of Physical Activity Advice and Prescription by Physicians in Primary Care

6-MONTH OUTCOMES

<table>
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<tr>
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<th>Incr. in moderate / vigorous activity (min/wk)</th>
<th>Incr. in moderate / vigorous activity (MET h/wk)</th>
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*p<.01

Designing a Physical Activity Prescription for Preventing T2D

- Mode/Type
- Duration
- Intensity
- Frequency
- Progression

Physical Activity Rx

Mode

- Large Muscle Groups
- Continuous or Rhythmic
- Low-Impact (if high risk of injury)
- Cross Train to prevent overuse injuries/burnout

Examples:
- Brisk Walking
- Cycling
- Swimming
- Rowing
- Stair Climbing/EFX
- Aerobics Classes/Videos
- Court Sports
- Strength Training
Strength Training Benefits

- Metabolism ↑
- Insulin sensitivity/glucose disposal ↑
- Immediate caloric expenditure
- Improve/maintain functional capacity
- Self-image, confidence

Strength Training Principles

- Warm-Up First
- 2-3 sets of 10-15 reps
- Work large muscle groups first
- Exhale w/exertion; no valsalva
- Progress reps, then ↑ wt in small increments
- Only ↑ wt if technique is sound
- Allow 48 hr recovery

Exercise Rx "Line Item": Duration

- 30-60 Minutes Generally Recommended
- Longer duration preferred for weight loss
- May be broken into a few shorter sessions (for weight loss)
- Include 2-5 Minute Warm-Up/Cool-Down
- Add Stretching After Workout
**Exercise Rx "Line Item": Intensity**

- 55% - 90% of Maximal Heart Rate
- RPE of "Fairly Light" (beginners) to “Hard” (experienced exercisers)
- Able to talk, but not sing

**Exercise Rx "Line Item": Frequency**

- Most (if not all) days of the week
- Think of exercise as medicine
- Cross Train to Prevent Overuse Injuries and Burnout
- Insulin sensitivity lost after 24-72 hrs
Activity Levels Affect Insulin Sensitivity PROFOUNDLY!

Physical Activity Rx

Progression

- SET UP TO SUCCEED!
- Beginners: Start with low intensity, short duration
- Build duration first, then increase intensity and frequency
- Add new activities as conditioning permits

Progression Through Interval Training

- Wk 1: 9 min light, 1 min hard (x3=30 min)
- Wk 2: 8 min light, 2 min hard (x3=30 min)
- Wk 3: 7 min light, 3 min hard (x3=30 min)
- Wk 4: 6 min light, 4 min hard (x3=30 min)
Etc...
Time For **YOU** to Be the Physical Activity Specialist!

Betty Bloodsugar

- 55 Year old female, 280 lbs (150 kg).
- Lives in inner-city; works at mall as a cashier. Also tends to 4 grandkids.
- Dad and sister have T2D. PCP told her she needs to lose weight.
- Has an old stationary bike, uses it to hang/dry clothes.
- Social butterfly.

Thank You for Prescribing Physical Activity!