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

The Root Cause of Type-2 Diabetes is INSULIN RESISTANCE

How Is Insulin Sensitivity Enhanced by Physical Activity?

Source: NIDDK, US Dept of Health & Human Services
Amazing Medicine

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

*Am J Physiol Endocrinol Metab 277: E733-E741, 1999

Amazing Medicine

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


Amazing Medicine

Health Concern | Effect of Physical Activity
--- | ---
Disuse Syndrome/Adhesive Capsulitis | Conditioning Gains
Flexibility/ROM
Work Capacity
Stress | Tension Release
More Restful Sleep
Depression | Self-Control, Pride
Pain | Endorphin Production

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

Wyart SII et al. Lessons from patients who have successfully maintained weight loss. Obesity Management. April 2005: 56 to 61
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 weekly minutes of physical activity.


The Value of General Daily Activity

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

General Daily Activity

- Ideas for Increasing Walking
  - 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

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

- Often discontinuous, varied intensity, less challenging
- May not be very challenging
- Still provides benefits!

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


- Randomized
- Controlled
- Multi-Center
- Blinded Analysis

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

6-MONTH OUTCOMES

<table>
<thead>
<tr>
<th></th>
<th>Incr. in moderate/ vigorous activity (min/wk)</th>
<th>Incr. in moderate/ vigorous activity (MET h/wk)</th>
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<td>Control</td>
<td>31.3</td>
<td>2.05</td>
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<td>Advice Only</td>
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<td>Advice + Prescription</td>
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<td>5.49*</td>
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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 $\uparrow$
- Insulin sensitivity/glucose disposal $\uparrow$
- 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 valsala
- Progress reps, then $\uparrow$ wt in small increments
- Only $\uparrow$ 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!