

## 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  $\geq 9$  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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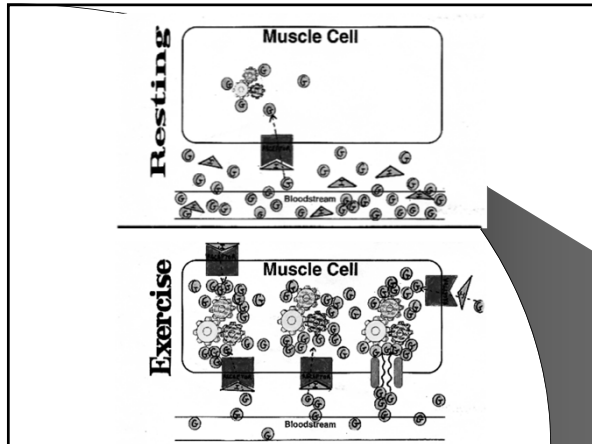
Source: NIDDK, US Dept of Health & Human Services

## The Root Cause of Type-2 Diabetes is INSULIN RESISTANCE



## How Is Insulin Sensitivity Enhanced by Physical Activity?





## Amazing Medicine

<b><u>Health Concern</u></b>	<b><u>Effect of Physical Activity</u></b>
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

<b><u>Health Concern</u></b>	<b><u>Effect of Physical Activity</u></b>
Heart Disease	Collateral Circulation ↓ Atherosclerosis
Blood Lipids	↓ LDL, ↑ HDL ↓ Triglycerides
Hypertension	↓ Diastolic BP
Obesity	Calorie Burning ↑ Metabolism Appetite Suppression*

\*American Journal of Physiology-Regulatory, Integrative and Comparative Physiology, 2008, No. 16.

## Amazing Medicine

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

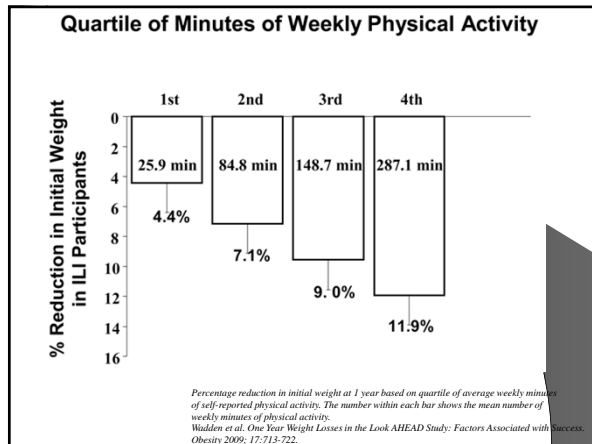
## Activity Recommendations

- **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

Wyatt HR et al. Lessons from patients who have successfully maintained weight loss. Obesity Management. April 2005; 56 to 61  
Catenacci VA et al. Physical activity patterns in the NWCR. Obesity. 2008; 16: 153 to 158



## 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**


- ✓ 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**

Grandes, et al. Arch Intern Med 2009; 169(7): 694-701

- Randomized
- Controlled
- Multi-Center
- Blinded Analysis



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

Control	Advice-Only	Advice + Prescription
<ul style="list-style-type: none"> <li>● Provider Training</li> <li>● Standard Care</li> </ul>	<ul style="list-style-type: none"> <li>● Provider Training</li> <li>● Used Web software re: benefits, risks, general activity suggestions</li> <li>● Summary pamphlet</li> </ul>	<ul style="list-style-type: none"> <li>● Same as advice group, +</li> <li>● Goal setting</li> <li>● Barriers addressed</li> <li>● 3-month Plan</li> <li>● Printed exercise Rx (mode, freq., duration, intensity, progression)</li> <li>● Self-monitoring log</li> </ul>
N=2069 MDs=27	N=1565 MDs=29	N=683 MDs=29

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


**6-MONTH OUTCOMES**

	Incr. in moderate / vigorous activity (min/wk)	Incr. In moderate / vigorous activity (MET h/wk)
Control	31.3	2.05
Advice Only	36.4	2.41
Advice + Prescription	<b>79.7*</b>	<b>5.49*</b>


\*p<.01

**Designing a Physical Activity Prescription for Preventing T2D**

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



**Physical Activity Rx Mode**



**Examples:**

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

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

## 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



Levels of Perceived Exertion (RPE)

1	Restless
2	Very, Very Light
3	Very Light
4	Fairly Light
5	Somewhat Hard
6	Hard
7	Very Hard
8	Very, Very Hard
9	Extremely Hard/Can't Breathe

## Exercise Rx "Line Item": Intensity



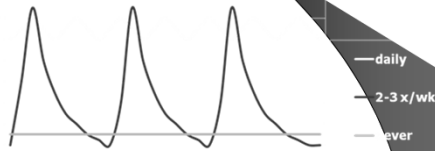
- 55% - 90% of Maximal Heart Rate
- RPE of "Fairly Light" (beginners) to "Hard" (experienced exercisers)
- Able to talk, but not sing

## 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!