

## Harnessing the Power of Exercise to Prevent Type-2 Diabetes

**Gary Scheiner MS, CDE**

Owner/Clinical Director  
Integrated Diabetes Services LLC  
gary@integrateddiabetes.com  
(610) 642-6055



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## Program Overview

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

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## 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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## Risk Factors for T2D

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### **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

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



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## How Is Insulin Sensitivity Enhanced by Physical Activity?



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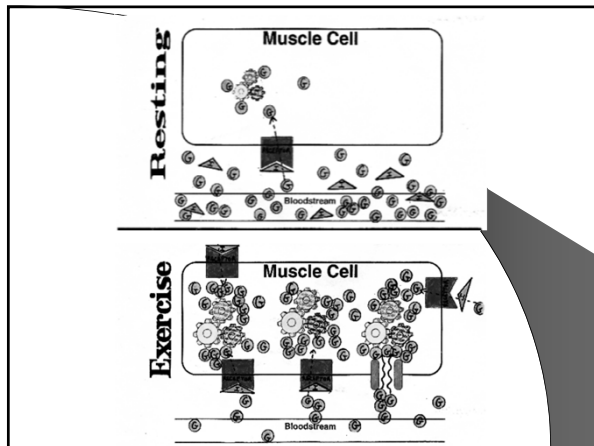
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## Amazing Medicine

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

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## Amazing Medicine

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

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## Amazing Medicine



### Health Concern

Disuse Syndrome/  
Adhesive Capsulitis

Stress

Depression

Pain

### Effect of Physical Activity

Conditioning Gains  
Flexibility/ROM  
↑ Work Capacity

Tension Release  
More Restful Sleep

Self-Control, Pride

Endorphin Production

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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

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## 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

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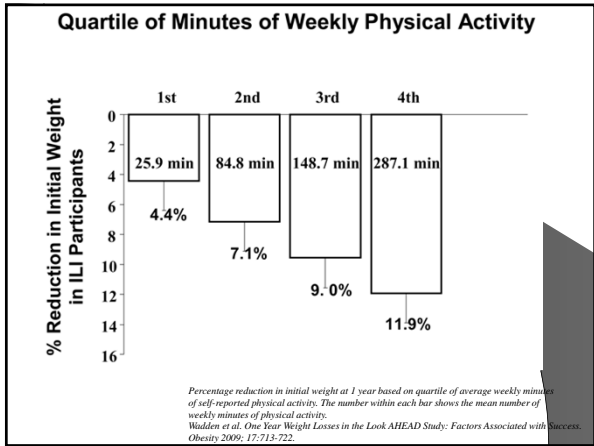
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### The Value of General Daily Activity

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

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### 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

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## 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

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## 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

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## 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

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**“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!

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**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




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**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

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**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	<b>31.3</b>	<b>2.05</b>
Advice Only	<b>36.4</b>	<b>2.41</b>
Advice + Prescription	<b>79.7*</b>	<b>5.49*</b>

\*p<.01

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

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




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**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




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## Strength Training Benefits



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

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## 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

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## 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

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Exercise Rx "Line Item":  
**Intensity**



Continuum of Perceived Exertion (RPE)

1	Very Light
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, Start to Squeeze Lips

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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

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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

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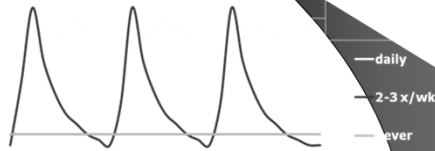
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## Activity Levels Affect Insulin Sensitivity PROFOUNDLY!



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## 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**

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## 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...

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## Time For YOU to Be the Physical Activity Specialist!

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### 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.



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Thank You for Prescribing Physical Activity!

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