Physical Activity & Exercise for the Type 2 Diabetes Patient – a clinical perspective

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objectives

1. Identify exercise contraindications and apply appropriate exercise prescription for diabetes complications, hypertension, heart disease, and obesity.

2. Explain fitness basics to the patient with diabetes, including the F.I.T.T. principle and exercise progression methods.

3. Assist the patient with specific fitness goals using tracking tools, rewards, and support.
nutrition advice examples

- You need to eat more fiber.
- You need to limit your carb intake to _______.
- You need to use smaller plates and bowls.
- You should drink less soda and more water.
- Etc, etc, etc.
You need to exercise more.

Solution: Be an example and exercise! Or fake it by using this presentation’s advice.
contents

- Type 1 Diabetes Considerations
- Get F.I.T.T. and make progress!
- Exercise Prescription & Contraindications
  - Type 2 Diabetes
    - Neuropathy, Foot Care
  - Heart Disease
  - Hypertension (Kidney Disease & Retinopathy)
  - Obesity
- Resources: Tracking tools, rewards, & support
- Exercise Examples
Most exercise research is for type 2 diabetes, but exercise recommendations are the same for type 1 and 2.

Why?

- Most complications for type 1 and type 2 are the same, except for:
  - Higher risk of hypoglycemia because type 1 are dependent on insulin (or patients not classified as type 1 but are solely dependent on insulin).
  - Higher risk of DKA (diabetic ketoacidosis)
• Type 1 Diabetes Considerations
• Get F.I.T.T. and make progress!
• Exercise Prescription & Contraindications
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    o Neuropathy, Foot Care
  o Heart Disease
  o Hypertension (Kidney Disease & Retinopathy)
  o Obesity
• Resources: Tracking tools, rewards, & support
• Exercise Examples
### Physical Activity vs. Exercise

<table>
<thead>
<tr>
<th></th>
<th>Example 1 (Physical Activity)</th>
<th>Example 2 (Exercise)</th>
<th>Example 3 (Exercise)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency</strong>&lt;br&gt;How often?</td>
<td>Every day</td>
<td>5 days per week</td>
<td>3 days per week</td>
</tr>
<tr>
<td><strong>Intensity</strong>&lt;br&gt;How hard?</td>
<td>Light-intensity Exercise</td>
<td>Moderate-Intensity Exercise</td>
<td>Vigorous-Intensity Exercise</td>
</tr>
<tr>
<td><strong>Timing</strong>&lt;br&gt;How long?</td>
<td>All Day</td>
<td>30 minutes</td>
<td>20 minutes</td>
</tr>
<tr>
<td><strong>Type</strong>&lt;br&gt;What kind?</td>
<td>- Going for a short walk&lt;br&gt;- Light housework&lt;br&gt;- Gardening&lt;br&gt;- Using the stairs&lt;br&gt;- Playing with the kids/grandkids&lt;br&gt;• <strong>Pedometer</strong></td>
<td>- Going for a brisk or longer walk&lt;br&gt;- Walking up a hill&lt;br&gt;- Going for a long bike ride&lt;br&gt;- Yoga, Tai Chi</td>
<td>- Running&lt;br&gt;- Cycling&lt;br&gt;- Swimming&lt;br&gt;- Playing football&lt;br&gt;- Exercise Classes</td>
</tr>
</tbody>
</table>
what an “active lifestyle” looks like

Source: Eat Smart Move More North Carolina.
exercise training

- **Cardiovascular/Aerobic**
  - Non-stop, continuous exercise for 30 minutes using large muscle groups, 3-5 days a week.

- **Resistance/Strength/Weight**
  - 2-3 times a week for 5-10 muscle groups, not performed 2 days in a row. 8-15 repetitions, 2-4 sets for each exercise.

- **Flexibility/Stretching**
  - All joints need stretching, hold each stretch for 30-60 seconds, as often as possible (every day and/or multiple times a day).

(Examples at the end)
Exercise and Type 2 Diabetes

The American College of Sports Medicine and the American Diabetes Association: joint position statement

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Although physical activity (PA) is a key element in the prevention and management of type 2 diabetes, many with this chronic disease do not become or remain regularly active. High-quality studies establishing the importance of exercise and fitness in diabetes were lacking until recently, but it is now well established that participation in regular PA improves blood glucose control and can prevent or delay type 2 diabetes, along with positively affecting lipids, blood pressure, cardiovascular events, mortality, and quality of life. Structured interventions combining PA and modest weight loss have been shown to lower type 2 diabetes risk by up to 58% in high-risk populations. Most benefits of PA on diabetes management are realized through acute and chronic improvements in insulin action, accomplished with both aerobic and resistance training. The benefits of physical training are discussed, along with recommendations for varying activities, PA-associated blood glucose management, diabetes prevention, gestational diabetes mellitus, and safe and effective practices for PA with diabetes-related complications.

Diabetes Care 33:e147–e167, 2010
G. Physical activity

Recommendations

- People with diabetes should be advised to perform at least 150 min/week of moderate-intensity aerobic physical activity (50–70% of maximum heart rate), spread over at least 3 days per week with no more than 2 consecutive days without exercise. (A)

- In the absence of contraindications, people with type 2 diabetes should be encouraged to perform resistance training at least twice per week. (A)
exercise heart rate

- Standard maximum heart rate is 220.
- 220-age x 50-70% = exercise heart rate range
- Example: 220-30 x 50-70% = 95 bpm – 133 bpm

- Stress test: use Heart Rate Reserve formula. Requires maximum heart rate and resting heart rate

- Many other formulas and factors to consider (medical status, medications).
- In exercise research, V02max is often used to prescribe exercise.
RPE – rating of perceived exertion

- A scale from 0-10 that you rate how hard you are working overall (includes how short of breath and how tired your legs feel) aka the Borg scale 6-20.

- If on beta blockers, this scale is preferred over a standard exercise heart rate calculation.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Nothing at all</td>
</tr>
<tr>
<td>1</td>
<td>Very, very light</td>
</tr>
<tr>
<td>2</td>
<td>Very light</td>
</tr>
<tr>
<td>3</td>
<td>Fairly light</td>
</tr>
<tr>
<td>4</td>
<td>Somewhat hard</td>
</tr>
<tr>
<td>5</td>
<td>Hard</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Very hard</td>
</tr>
<tr>
<td>8</td>
<td>Extremely hard/maximal exertion</td>
</tr>
</tbody>
</table>

Starting to exercise:
- Low
- Moderate Intensity
- Ask your doctor:
- Moderate to High Intensity
Exercise Training for Type 2 Diabetes Mellitus: Impact on Cardiovascular Risk: A Scientific Statement From the American Heart Association

Thomas H. Marwick, Matthew D. Hordern, Todd Miller, Deborah A. Chyun, Alain G. Bertoni, Roger S. Blumenthal, George Philippides and Albert Rocchini

Circulation. 2009;119:3244-3262; originally published online June 8, 2009;
doi: 10.1161/CIRCULATIONAHA.109.192521

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**Best: Higher intensity, Aerobic & Resistance**

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Participants</th>
<th>Frequency</th>
<th>Duration</th>
<th>Intensity</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sigal</td>
<td>2007</td>
<td>251 T2DM</td>
<td>3 d/wk</td>
<td>6 mo</td>
<td>75% $HR_{max}$</td>
<td>Improvement in glycemic control, Reduction in BMI, waist circumference, fat mass, Increase in muscle mass, Improvement in glycemic control, Reduction in subcutaneous fat, Increase in muscle mass, Greater improvement in glycemic control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 d/wk</td>
<td>6 mo</td>
<td>7-9 RM</td>
<td>Resistance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 d/wk</td>
<td>6 mo</td>
<td>75% $HR_{max}$, 7-9 RM</td>
<td>Aerobic &amp; resistance</td>
</tr>
</tbody>
</table>

**Good: Moderate-High intensity, Aerobic only**

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<th>Intensity</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kadoglou</td>
<td>2007</td>
<td>95 T2DM</td>
<td>4 d/wk</td>
<td>8 mo</td>
<td>50%-80% $\dot{VO}_{2max}$</td>
<td>Improvement in glycemic control, Increased $\dot{VO}_{2max}$</td>
</tr>
</tbody>
</table>

**Poor: there are benefits, but results are poor.**

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
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<th>Duration</th>
<th>Intensity</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khan</td>
<td>1995</td>
<td>39 Sedentary T2DM</td>
<td>5 d/wk</td>
<td>15 wk</td>
<td>40%-60% $\dot{VO}_{2max}$</td>
<td>No improvement in glycemic control, Reduction in body fat, Increase in $\dot{VO}_{2max}$</td>
</tr>
<tr>
<td>Wing</td>
<td>1988</td>
<td>25 T2DM</td>
<td>3 d/wk</td>
<td>81/2 mo</td>
<td>3 mph</td>
<td>No improvement in glycemic control, No improvement in BMI, Greater reduction in medication, Reduction in BMI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 T2DM</td>
<td>4 d/wk</td>
<td>141/2 mo</td>
<td>3 mph</td>
<td>No improvement in glycemic control, No improvement in BMI, Greater reduction in medication, Reduction in BMI</td>
</tr>
</tbody>
</table>
• General rule: add 10% per week. Change components of F.I.T.T. to increase exercise volume. (“More exercise” sounds scary, try “More calories burned”)  
• Concerns for safety: 10% per 1-2 weeks.  
• Exercise logging: Track time and/or distance; track repetitions/sets, reducing rest times.  
• Tell patient: “Make exercise **challenging**, but not hard.”  
• Always consider illness, injury, irregular exercise.  
• Maintain: if goal is met.  
• Stuck? Exercise needs to be changed, ex. cross training
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- Exercise Examples
Risk of injury

- No exercise: injury
- Some exercise: more injury
- More exercise: even more injury

Always remember: **Benefit > Risk**
general safety guidelines

- Exercise clearance from doctor
  - What can I do? What can’t I do?
  - Do I need a stress test?
- Recognize symptoms of a heart attack
- Avoid overheating; have an exercise plan for hot or cold weather. Drink water before, during, and after exercise.
- Include a warm up and cool down for every exercise (cardio **and** strength)
- Strength training guidelines
  - 1. Posture. 2. Breathe 3. Slow
- “Talk Test”
  - If you can talk = safe.
| For and Against Screening for CAD in patients with T2DM Before Exercise Training |
|---------------------------------|-----------------|-----------------
| **Detection of some patients w/ severe CAD** | **For** | **Against** |
| | Silent CAD; candidates for revascularization therapy | No published data that screening in asymptomatic pts results in improved outcomes; 1 randomized trial: no effect on clinical outcomes |
| **Identification of more minor CAD** | Recognition of CAD could lead to more intensive treatment of risk factors | Existing recommendations in T2DM already recommend more aggressive treatment of hypertension and lipids |
| **Identification of low risk** | Risk-stratify symptomatic and asymptomatic patients with T2DM | Annual rates of CAD and MI or total mortality with normal or low-risk images are 2% to 6. |
| **Cost-effectiveness** | | 80% of the 18 million diabetic patients in the U.S. do not have established CAD, which leads to many negative test results |
| **Use in exercise prescription** | Identification of patients with MI may be of value in instructing these patients to keep their target heart rate below their ischemic threshold | |
type 2 diabetes

- **Risk of hypoglycemia or DKA** (patient with type 1 or patient using insulin or medication that causes hypoglycemia)
  - Follow “Rule of 15,” check blood sugars before and after exercise, carry glucose tablets/snacks, avoid late night exercise to avoid hypoglycemia while sleeping.
  - Do not exercise below 100 mg/dl, with ketones in urine, or above 300 mg/dl.
  - Exercise with a buddy or wear a diabetes bracelet, necklace, or shoe tag.
  - Talk with doctor or diabetes educator to adjust insulin requirements.

- **Foot care**
  - Shoe sole is thick, no open toes, laces, white socks, toenails are short. Referral to podiatrist is recommended for any problems.

- **Neuropathy**
  - Peripheral = light/moderate pain: weight bearing is okay. Intense pain: choose non-weight bearing activities. Loss of sensation in the feet and legs is high risk for injury and overstretching. Include balance exercises.
  - Autonomic = high risk for hypoglycemia unawareness. Choose low intensity exercises and a temperature controlled exercise environment, monitor heart rate and blood glucose frequently, and drink water often.
heart disease

- Stress test and/or CAD clearance for exercise from physician and/or cardiologist required.
  - Use heart rate from stress test to determine exercise intensity.
  - Safest alternative: the maximum exercising heart rate is 20 bpm above resting heart rate or dependent on symptoms.

- Heart rate & exercise intensity education is emphasized and monitored regularly.

- Review symptoms of previous heart problems regularly; always ask if these problems occur with exercise:
  - Shortness of breath, chest pain or ANY upper body pain, lightheadness, dizziness, fainting, nausea.
hypertension (high blood pressure)

- The following rules also apply to retinopathy and kidney disease:
  - Avoid high-intensity exercise
  - Low-impact aerobic exercise is preferred.
  - Heavy lifting is not allowed. Avoid Valsalva maneuver (breath holding) during strength training.
  - If your ophthalmologist restricts activities that lower the head, exercises like yoga is avoided.
If goal is weight loss:
- Emphasize aerobic exercise over resistance, but both are ideal.
  - Frustrations will occur if too much resistance training is performed due to muscle weight gained.
- Increasing exercise volume is critical to burn sufficient calories.
- Fitness classes are difficult to track exercise volume. Focus on increasing physical activity, using pedometers, or other ways to monitor exercise volume.

Other:
- Musculoskeletal joints are always at high risk of injury. Choose low-impact or non-weight bearing activities. Joint pain may never go away unless weight loss occurs.
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resources

- See handout:
  - Goals, tracking examples
  - The importance of rewards & support
- Patient resources:
  - Websites/apps: MapMyFitness (Run, Walk, Tri, Hike), MyFitnessPal, Fitocracy, GymPact
  - acefitness.org/library
  - Pedometers: ipod nano, iphone apps, fitbit, striiv, nike fuelband.
  - Heart rate monitors (ex. polar), GPS watches
  - Earndit.com: get points for gift certificates or donate to charity if linked to ipod, foursquare, mapmyfitness, fitbit, etc.
- Professional resources:
  - fitness.gov, acsm.org, acefitness.org
  - How do I stay on top of new exercises trends?
tip?
Postprandial Walking is Better for Lowering the Glycemic Effect of Dinner than Pre-Dinner Exercise in Type 2 Diabetic Individuals

Other studies referenced: Light-moderate exercise (>20 minutes) after any meal decreases glucose more than fasting conditions. Why? Maybe due to meal consumption releasing endogenous insulin.
What does this mean for the dietitian?

• Don’t:
  ○ Provide every patient/client with the same exercise plan.

• Do:
  ○ Assess/evaluate, know their medical history, and personalize their exercise plan.
  ○ Provide encouragement if they are exercising safely.
  ○ Exercise can be like eating wrong or eating too much (*yes, it’s possible to exercise too much!*), be ready to explain to them how to fix their exercise plan.
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Exercise Examples
exercise examples

- I am not able to provide you the pictures of the following, but feel welcome to google or youtube:
  - Best examples:
    - Non-weight bearing or low-impact cardio exercises, recumbent bike, cardio machines, weight machines, water aerobics, tai-chi, yoga
  - Good examples:
    - Spinning, step aerobics, zumba, any fitness classes.
    - Stability ball exercises, Wii Fit, Chair exercises, arm ergometry.
    - Acefitness.org/exerciselibrary, smartphone fitness apps.
  - Chronic knee pain:
    - Non-weight bearing exercises, hamstring/quadriceps exercises, thigh/hip flexor & hamstring stretches
  - Fall prevention:
    - Balance exercises, floor exercises.
  - Chronic back pain:
    - Stability ball exercises, ab and back exercises, floor exercises (relieves spine pressure), thigh/hip flexor & hamstring stretches
  - High injury risk examples:
    - High intensity exercises like sprints, P90x, Crossfit, Boot camp.
  - Bad form weight training
    - google “bad form weight training” “bad form lunges” “bad form (any exercise)"
  - Stretches
Referrals to Exercise Physiologist

- **Diabetes Type 1 or Type 2 (no pre-diabetes)**
  - Exercise education is part of Diabetes Self-Management Training/Education (DSMT/E) as a billable insurance service. Patient should have received or been offered initial 10 hours of diabetes education as recommended by Medicare. 2 hours additional education hours are allowed every year, more if there is physician documented medication or medical changes. Some insurances offer unlimited visits but the physician still needs to specify number of hours on referral form.
  - Patient will be required to obtain exercise clearance from their doctor.

- **Other**
  - Available as cash-pay

- **Appointments:**
  - 1st hour initial: Assessment for safety & exercise barriers, light exercise, goal setting, home program.
  - Follow up 30 minute visits:
    - 4 weeks to 6 months.
    - Frequent visits are for safe exercise progression or 3-6 months follow up to change program needs.
  - Goal: Patient is independent with exercise program and understands how to safely progress exercise to meet health and fitness goals.

- **Contact:**
  - Referral form is available [http://hhdc.ouhsc.edu/patients/patient-info/](http://hhdc.ouhsc.edu/patients/patient-info/)
  - We can contact and fax to referring doctor or have patient take form to doctor.
  - We can call or patient can contact us for an appointment.
  - 405-271-3455 exercise@haroldhammdiabetes.com
  - 1000 N. Lincoln Blvd Ste 1800 OKC, OK 73104 (located on 1st floor temporarily, 3rd floor in 2013)