Activity and Diabetes: Benefits, Precautions and Guidelines

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Program Objectives
At the end of this presentation, the participant will be able to:

1. Describe how the body utilizes fuel during exercise
2. Describe at least 3 major benefits (but not limited to) of exercise for persons with diabetes
3. Verbalize strategies to prevent hypoglycemia during exercise
Program Objectives

4. State guidelines for setting up safe guidelines for people with diabetes.

5. Discuss exercise precautions for people with complications related to diabetes.

Benefits of Exercise for Persons w/Diabetes (Type 1 and Type 2)

- Improved insulin sensitivity
- Reduced BG levels (Type 2)
- Improved glucose metabolism
- Reduced BP in hypertensives
- Improved lipid profile – decreased triglycerides & LDLs and increased HDLs
- Reduced risk of CVD

American College of Sports Medicine, 9th ed. (2013)
Benefits of Exercise for Persons w/Diabetes (Type 1 and Type 2)

- Improved endurance, strength, & flexibility
- Decreased body fat & increased muscle mass
- Improved self-esteem & decreased depression
- Sleep better at night
- Improved mobility, balance, & functional capacity

American College of Sports Medicine, 9th ed. (2013)
Pre-Exercise Screening for Persons w/Diabetes

- History & physical exam (new Dx.)
- I.D. other physical limitations (orthopedic)
- BP & peripheral pulses / neuropathy
- Lipid profile: Chol., LDL, HDL, Trig.
- Nutritional evaluation (over/under Wt.)
- Eye exam (retinopathy)
- Kidney function (nephropathy)

ACSM, 9th ed. (2013)
Pre-Exercise Screening Cont.

Graded exercise test recommended for:
* Known/suspected CVD
* >35 yrs. Old
* Type 2 diabetes for >10 yrs.
* Type 1 diabetes for >15 yrs.
* Peripheral vascular disease
* Neuropathy
* Microvascular disease (retinopathy/nephropathy)

2002 ADA Clinical Practice Recommendations, Diabetes Care, 25, (Supplement 1)
Fuel Sources for Exercise

- **First 8-12 sec.** High energy phosphates are broken down to produce ATP (oxygen deficit)
- **From 5-10 min.**, muscle glycogen is broken down to produce ATP (glycolysis)
- **From 10-40 min.**, liver glycogen is broken down (glycogenolysis)
- **From 40-90 min.**, conversion of lactate, glycerol, & amino acids (glyconeogenesis)
- **From 90-180 min.**, glucose utilization peaks
- **Exercise >120 min.**, free fatty acids and triglycerides (lipolysis)

Hormonal Response Regulates BG Levels During Exercise

- Muscles contracting causes uptake of glucose, which can last 24-48 hrs.
- Decreased insulin levels and increased counter regulatory (stress) hormones (catecholamines, glucagon, cortisol, growth hormone, epinephrine)
- Increased glucose production by the liver
- Normal BG levels
Hyperglycemia Following Exercise in Diabetes

- Insulin deficiency causing a decrease in cellular uptake of glucose and an increase in hepatic glucose production
- Mediated by “stress hormones”
- Exercise at too high an intensity level for the individual’s fitness level
Exercise During Hyperglycemia

- If BG is >250 mg/dl with +ketones, exercise should be avoided until BG is in better control
- In Type 1’s this may lead to even higher BG & ketosis due to inadequate insulin availability
- In Type 2’s small ketones may be present due to weight loss, not lack of insulin, thus exercise may not be contraindicated
Lows, Highs, and Exercise

- The longer and more strenuous the exercise, the more likely the blood glucose will go low.
- Less trained individuals will more likely go low.
- Strenuous and anaerobic exercise may raise blood glucose.

Intensity of Exercise:

- **Low** – Not in target heart rate zone (leisurely walking, light gardening, shopping, bowling)
- **Moderate** – Low end of target heart rate zone (brisk walking, strength training, tennis, golf)
- **High** – High end of target heart rate zone (jogging, running, shoveling snow, skiing, competitive sports)

*Joslin: Fundamentals of Insulin Pump Therapy, 2002*
Hypoglycemia During Exercise

- Usually does not occur in well-controlled individuals
- Miscalculation of meal bolus
- Length or intensity is greater than anticipated

Hypoglycemia Treatment

**“RULE OF 15”**
15 Grams CHO
Wait 15 minutes
Repeat 15 CHO if BG still <70

- 4 ounces
- 3-4 tabs
- Check BG
- Before driving
- Glucagon

Identification
Post Exercise Hypoglycemia

- Usually more severe and lacks warning signs
- Often occurs 6-15 hrs. following exercise
- Frequently nocturnal
- Not related to metabolic control, age, or duration of diabetes
- Often occurs after a single bout of vigorous or prolonged exercise

Diabetes Care 10:548-588, 1987
Post Exercise Hypoglycemia Guidelines:

- Keep a lower basal rate 24-36 hrs. post-exercise
- Eat a snack (carbohydrate/protein)
- Monitor BG frequently and overnight if exercise is not habitual or performed late in the afternoon

Exercise Guidelines:

- **Intensity**: low to moderate; 50-85% of heart rate reserve (220-age=est. max HR-resting HR= heart rate reserve x 50% +RHR=low EHR; then HRR x 85%)>Aerobic Zone
- May use “talk test” or “rate of perceived exertion” chart to gauge intensity
- Certain medications can affect resting and exercise heart rate (beta blockers)

“I pay you five pebbles a session to be my personal trainer, but all we ever do is swim!”

Rating of Perceived Exertion (RPE)

- 6
- 7 VERY, VERY LIGHT
- 8
- 9 VERY LIGHT
- 10
- 11 FAIRLY LIGHT
- 12
- 13 SOMEWHAT HARD
- 14
- 15 HARD
- 16
- 17 VERY HARD
- 18
- 19 VERY, VERY HARD
- 20
Exercise Guidelines Cont.

- **Duration**: 20-60 min., plus 5-10 min. of warm up and cool down. Cumulative, shorter exercise bouts (10 min. ea.) may also be performed

- **Frequency**: 3-4 x wk. on non-consecutive days; 5-7 x wk. for weight loss

- **Progression**: start low and increase gradually as the body adapts to the exercise

- **Type**: Aerobic exercise is best; walking, biking, swimming, rowing, water / bench aerobics, recreational sports

- **Strength training**: circuit training with light to moderate resistance

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Exercise with Diabetic Complications

- **Peripheral Neuropathy (nerve/circulation)** Can result in loss of sensation and balance. Exercise at low to moderate intensity. Use non-weight-bearing activity (swimming, cycling). Wear properly fitted shoes w/ cotton socks. Look closely at feet after exercise, and daily.

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Exercise with Diabetic Complications Cont.

**Retinopathy (eye disorder)** Perform low-impact activities, Avoid breath-holding or Valsalva maneuvers, Avoid heavy weight lifting, Maintain systolic BP pressure <170, Resistance training is contraindicated with proliferative retinopathy.

- Strenuous exercise may result in vitreous hemorrhage / retinal detachment
- Pt. should get ophthalmologist clearance

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Exercise with Diabetic Complications Cont.

**Nephropathy (kidney disorders)**
Avoid sustained elevation in BP; Low-impact, weight-bearing, aerobic activities are best. Light weight training if non-proliferative, maintain proper hydration, Avoid breath-holding / Valsalva maneuvers, Wear good, supportive shoes.

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Exercise with Diabetic Complications Cont.

- **Autonomic Neuropathy** – Can lead to decreased CV response to exercise, impaired thermoregulation / hydration response, impaired counter regulatory response (ICR) and orthostatic hypotension.
- Avoid high intensity exercise
- Avoid exercise in climate extremes
- Hydration is very important (water)
- Monitor BG frequently in pts. w/ ICR

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Exercise with Diabetic Complications Cont.

- **Hypertension**
  
  Avoid breath-holding / Valsalva maneuvers, moderate intensity aerobic activities are best, could incorporate light weight-training, hydration is important, wear good, supportive shoes.

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Exercise Principles

- **Overload** – A muscle / system adapts to an unaccustomed work load.
- **Progression** – Frequency, Intensity or Duration of exercise must be increased as muscles / systems adapt to load(s).
- **Specificity** – Exercise should be specific to the muscle / system being trained.
- **Reversibility** – Detraining occurs with cessation of exercise.

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"They say kids these days are too fat because we don't get enough aerobic exercise. Maybe we should chew faster!"
Keys to Exercise Adherence

- Assist pts. In clear, specific and realistic, short-term and long-term goals.
- Ask pts. to identify obstacles to exercise, and assist them to overcome barriers. (Pts. must take owner-ship in program)
- Help pts. develop a daily/weekly routine
  (“Exercise Is Medicine!”)
- Checking BG Pre/Post Activity Positive Reinforcement.

Keys to Exercise Adherence Cont.

- Offer periodic re-evaluations of pts. to illustrate progress.
- Social support / encouragement is vital !! (From the educator to the family)
- Make exercise FUN whenever possible !!
Comprehensive Approach to Diabetes Management

- Diet
- Exercise
- Stress Management
- Medications
- Education

“What fits your busy schedule better, exercising one hour a day or being dead 24 hours a day?”
Websites for Resources

- childrenwithdiabetes.com
- diabetes.org (ADA)
- diabetes-exercise.org (DESA, formerly IDAA)
- diabetes.com
- diabetesnews.com
- jdrf.org
- ACSM 2013