

What Does Fit Mean?

Diabetes Initiative – Fall Symposium
September 12, 2008
Brian D. Keisler, MD
CAQ Primary Care Sports Medicine
University of South Carolina Department of
Family and Preventive Medicine

Overview

- Definition of fitness
- Health benefits of exercise
- **Review of physical activity recommendations**
 - ACSM
 - ADA
- Considerations for diabetics (type 2)
- Type 1 considerations
- Counseling patients

Definition

What Does Fit Mean?

- **Definition**
- **Fitness (n.)**
 - The state or condition of being fit
 - Good health or physical condition, especially as the result of exercise and proper nutrition
- American Heritage Dictionary of the English Language, 4th ed, 2000

What Does Fit Mean?

- Why do people pursue fitness?
 - Cardiovascular health
 - Emotional well-being
 - Weight loss
 - Athletic performance

What Does Fit Mean?

- Components

- Strength
- Power
- Agility
- Balance
- Flexibility
- Local muscle endurance
- ***Cardiovascular/metabolic health***
- Strength endurance
- Coordination

Health Benefits

What Does Fit Mean?

- **Cardiovascular benefits**
 - Higher levels of fitness/physical activity associated with lower subsequent CV and overall mortality
 - Church, et al (2004)
 - Divided men into quartiles based on CV fitness
 - Lowest (4.5), second (2.8), third (1.6) quartiles have greater risk of overall mortality

What Does Fit Mean?

- **Metabolic benefits (DM)**
 - Increases insulin sensitivity in tissues
 - Improves glucose uptake by muscles
 - 7-20x

What Does Fit Mean?

- **Metabolic benefits (DM)**
 - Reduction in incidence of type 2 DM
 - Reduces risk of progression of impaired glucose tolerance to type 2 DM
 - Decreases A1c
 - Meta-analysis
 - Boule, et al
 - 7.65% vs. 8.31% ($p < 0.001$)
 - Benefits seen with moderate intensity exercise

What Does Fit Mean?

- **Weight loss**
 - Exercise alone produces modest weight loss
 - CV and metabolic effects independent of weight loss
 - Obese individuals
 - Increased intake
 - Decreased activity outside of exercise
 - Activity level for weight loss > CV health, glycemic control

ACSM/ADA Recommendations

What Does Fit Mean?

- Recommendations for physical activity
- 1995 – American College of Sports Medicine (ACSM) & Center for Disease Control and Prevention (CDC)
- 2007 – ACSM & American Heart Association (AHA)

What Does Fit Mean?

- 1995 recommendations
 - 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week

What Does Fit Mean?

- 2007 update
 - Clarified recommended frequency of moderate-intensity exercise
 - Vigorous-intensity exercise incorporated
 - Activities are complementary and can be combined (METs)
 - Activity is in addition to routine ADLs of light intensity or < 10 minutes duration (can count ADLs if at least moderate-intensity and at least 10 minutes in duration)

What Does Fit Mean?

- 2007 update (cont.)
 - Physical activity above the minimum recommendation provides greater health benefits
 - Activity can be accumulated in bouts of 10 minutes to reach goal
 - Muscle strengthening activities incorporated
 - Individuals age 18-65

What Does Fit Mean?

- **Moderate-intensity exercise**
 - Brisk walk
 - Noticeably accelerated heart rate
 - 30 minutes daily
 - 5 days/week
 - Can be divided into 10 minute intervals

What Does Fit Mean?

- **Moderate-intensity exercise**
 - Studies showing CV and metabolic benefits
 - Insulin sensitivity
 - Duration < 72 hours
 - No more than 2 consecutive days without aerobic physical activity

What Does Fit Mean?

- **Vigorous exercise**
 - Jogging
 - Rapid breathing
 - Substantial increase in HR
 - 20 minutes daily
 - 3 days/week

What Does Fit Mean?

- **Vigorous exercise**
 - Not studied for health effects (CV, glucose control)
 - Transient increase in risk of sudden cardiac death (esp in sedentary individuals)
 - Production of counterregulatory hormones cause a reduction in insulin action

What Does Fit Mean?

- Can combine moderate-intensity and vigorous activity to reach goals
- Use metabolic equivalents (METs) to calculate energy expenditure

What Does Fit Mean?

- Sitting quietly = 1 MET
- Walking at 3 mph = 3.3 METs
- Jogging (12 min/mile) = 8 METs

- Moderate = 3.0-6.0 METs
- Vigorous > 6.0 METs

What Does Fit Mean?

- METs x minutes x days/week (intensity x duration)
 - MET·min/wk
- Goal: 450-750 MET·min/wk
- Moderate activity (30 min/d, 5 d/wk)
 - $3.3 \text{ METs} \times 30 \times 5 = 490 \text{ MET·min/wk}$
- Vigorous activity (20 min/d, 3 d/wk)
 - $8.0 \text{ METs} \times 20 \times 3 = 480 \text{ MET·min/wk}$

What Does Fit Mean?

- **Muscle-strengthening activities**
 - At least 2 days/week
 - Performed on non-consecutive days
 - Utilize major muscle groups
 - Use resistance that allows 8-12 repetitions resulting in fatigue

What Does Fit Mean?

- **Muscle-strengthening activities**
 - **Safe**
 - In two studies, average age 66
 - Even with increased risk for cardiac events
 - Demands comparable to occasional aspects of ADLs (climbing stairs, walking up a hill)
 - Novices should consider having initial supervision by qualified exercise specialist

What Does Fit Mean?

- **Flexibility?**
 - Does not reduce risk of exercise-induced injury
 - Study showed no reduction in risk of ulceration in diabetics
 - Insufficient evidence to recommend for or against flexibility exercises as routine part of physical activity

What Does Fit Mean?

- Adverse effects?
 - Cardiovascular (Sudden cardiac death)
 - Transient increased risk, more so with vigorous exercise
 - 10x more common in previously sedentary individuals
 - Very low risk with moderate-intensity exercise
 - SCD = 1 in 1.6 million episodes
 - Overall, improvements in CV health > transient risk

What Does Fit Mean?

- Pre-exercise testing
 - Exercise stress test
 - Controversial, little available data
 - Poor predictive value in low risk persons
 - Not cost-effective

What Does Fit Mean?

- Exercise stress test
 - ACSM recommendation
 - Consult physician/stress test prior to beginning **vigorous** exercise
 - Men \geq 45 years
 - Women \geq 55 years
 - 2 or more major cardiac risk factors
 - Signs/symptoms of coronary artery disease
 - Known cardiac, pulmonary or metabolic disease
 - Asymptomatic individuals exercising at **moderate-intensity** do not need to consult physician

What Does Fit Mean?

- Adverse effects?
 - Musculoskeletal (MSK)
 - $\frac{1}{4}$ to $\frac{1}{2}$ of active adults will have a MSK injury
 - Physically active individuals
 - Increased risk of MSK injury during exercise (esp as intensity increases)
 - Decreased risk of MSK injury outside of injury
 - Rates not significantly different

Considerations for Type 2 Diabetics

What Does Fit Mean?

- Eval before beginning
 - Physician eval (stress test?) for sedentary individuals beginning vigorous physical activity
 - Moderate-intensity physical activity does not require physician eval
 - Little to no evidence to guide physicians for eval prior to beginning resistance training

What Does Fit Mean?

- Non-optimal glycemic control
 - Previous recs
 - No exercise for:
 - BS > 250 and ketosis
 - BS > 300 with or w/o ketosis
 - As long as adequately hydrated and no ketosis, do not have to postpone activity solely for hyperglycemia (esp if postprandial)

What Does Fit Mean?

- Nonoptimal glycemic control
 - Hypoglycemia
 - Individuals treated with insulin or insulin secretagogues
 - Greatest risk when insulin levels are at their peaks or activity is prolonged
 - Preexercise carbohydrates if BS < 100
 - Individuals **not** treated with insulin or insulin secretagogues
 - Rare
 - No need for preexercise carbohydrates

What Does Fit Mean?

- Concomitant medications
 - Diuretics
 - Interfere with fluid/electrolyte balances
 - β -blockers
 - Blunt adrenergic response of hyperglycemia
 - Reduce maximal exercise capacity
 - Negative inotropic and chronotropic effects
 - Probably not an issue with moderate-intensity activity

What Does Fit Mean?

- **Diabetic complications**
 - Not much research in presence of complications
 - Most recommendations based on expert opinion

What Does Fit Mean?

- Retinopathy

- Nonproliferative retinopathy
 - No adverse effects
 - Aerobic and resistance exercise
- Severe nonproliferative retinopathy or proliferative retinopathy
 - Risk of vitreous hemorrhage or retinal detachment with vigorous aerobic or resistance exercise

What Does Fit Mean?

- Retinopathy
 - Can resume vigorous aerobic or resistance exercise 3-6 months after successful laser photocoagulation

What Does Fit Mean?

- **Peripheral Neuropathy**
 - No specific studies assessing risk of exercise-induced injury
 - Likely best to encourage non-weight bearing activities

What Does Fit Mean?

- **Autonomic neuropathy**
 - Should undergo cardiac investigation prior to initiation
 - Risks
 - Decreased cardiac responsiveness to exercise
 - Postural hypotension
 - Impaired thermoregulation
 - Impaired thirst

What Does Fit Mean?

- **Microalbuminuria and Nephropathy**
 - Physical activity can transiently increase urinary protein excretion
 - No evidence that exercise increases rate of progression of diabetic kidney disease
 - No specific restrictions

Considerations for Type 1 Diabetics

What Does Fit Mean?

- Insulin dosing/blood sugar monitoring
 - May need decreased insulin dosages
 - Particularly insulin that peaks during exercise
 - Exercise within 1 hour of insulin injection speeds absorption and peak effect
 - Avoid exercising muscle groups where insulin injected for 1 hour (short-acting insulin)
 - May require frequent blood sugar monitoring

What Does Fit Mean?

- Hypoglycemia
 - More likely in the evening
 - Diurnal variations of growth hormone levels
 - Blood glucose levels prior to exercise:
 - $< 130 \rightarrow$ 1-2 carb exchanges (60 kcal)
 - 130-180 \rightarrow 1 carb exchange
 - 180-240 \rightarrow No intake
 - $\geq 250 \rightarrow$ check for ketosis
 - Keep easily digested carbohydrates readily available

What Does Fit Mean?

- Type 1 diabetics are susceptible to ketoacidosis
- Counterregulatory hormones (catecholamines, cortisol, growth hormones)
 - Increase glucose levels when ≥ 250 -300 prior to exercise
 - Increase in ketones if ketosis present
- No exercise if ketosis present

Counseling For Physical Activity

What Does Fit Mean?

- **Counseling**

- Only 31% of Americans meet recommendations for physical activity
 - Decreases with age
- Increasingly sedentary lifestyle
 - Economic incentives
 - Increased compensation for sedentary vs. active work
 - Technology reducing energy needed for activities

What Does Fit Mean?

- **Counseling**

- **Physician visits**

- 84% of Americans visit a physician each year
 - Average of 2.1 visits each
- In one study, # of patients improving physical activity level increased 50% after receiving physician advice

What Does Fit Mean?

- **Counseling**
 - Physician visits
 - Physicians often fail to advise about activity
 - Time constraints
 - Insufficient knowledge
 - Lack of practical tools

What Does Fit Mean?

- **Counseling**
 - Written prescription
 - Assessment tools
 - Physical Activity Assessment Tool
 - Supportive materials
 - Addressing barriers
 - Financial
 - Transportation
 - Safety
 - Helpful hints
 - Lifestyle activities more likely to be sustained than structured activities

What Does Fit Mean?

- Counseling

- Five A's model

- Assess → determine current level and knowledge of physical activity
- Advise → review health benefits of regular physical activity and current recommendations
- Agree → development of plan; shared decision making
- Assist → provide information (written rx, supportive materials), address barriers
- Arrange → F/u visit

Resources

- Sigal, RJ, et al. Physical Activity/Exercise and Type 2 Diabetes: A Consensus Statement from the American Diabetes Association. *Diabetes Care*. Vol. 29, Num. 6, June 2006
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