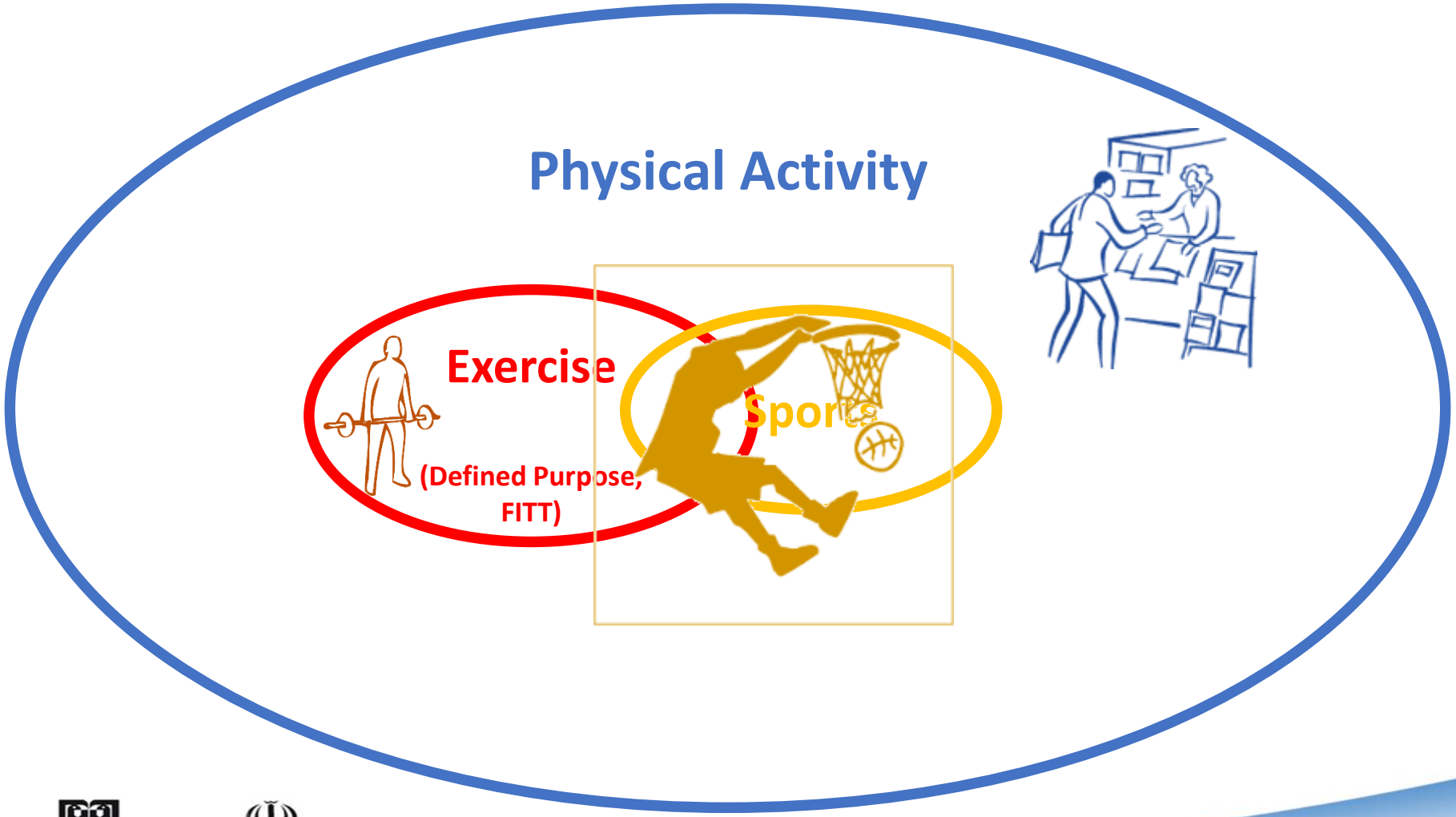
Physical Activity in Diabetes

Gabric Diabetes Education Association

Know the Difference!

Diabetes in Practice
Integrated Approach



The Bigger Picture

- Interrupt Prolonged sitting every 30 min
- bouts of light activity

Colberg, et al.(2016).

Types of exercise

- **Aerobic exercise** involves repeated and continuous movement of large muscle groups: walking, cycling, jogging, and swimming
- **Resistance (strength) training** includes exercises with free weights, weight machines, body weight, or elastic resistance bands
- **Flexibility exercises** improve range of motion around joints
- **Balance exercises** benefit gait and prevent falls




BENEFITS OF EXERCISE (aerobic training)

In individuals with type 2 diabetes, regular training reduces A1C, triglycerides, blood pressure, and insulin resistance

In type 1 diabetes, aerobic training increases cardiorespiratory fitness, decreases insulin resistance, and improves lipid levels and endothelial function

BENEFITS OF EXERCISE (resistance training)

- improvements in muscle mass, body composition,
- strength, physical function,
- bone mineral density,
- insulin sensitivity,
- Blood pressure
- lipid profiles
- cardiovascular health

Diabetes is an independent risk factor for low muscular strength and accelerated decline in muscle strength and functional status

- The effect of resistance exercise on glycemic control in type 1 diabetes is unclear

Tonoli, Cajsa, et al. "Effects of different types of acute and chronic (training) exercise on glycaemic control in type 1 diabetes mellitus." *Sports medicine*42.12 (2012): 1059-1080.

- Resistance training benefits for individuals with type 2 diabetes include:
  - improvements in glycemic control
  - insulin resistance
  - fat mass and lean body mass
  - blood pressure
  - Strength

Gordon, B. A., et al. "Resistance training improves metabolic health in type 2 diabetes: a systematic review." Diabetes research and clinical practice 83.2 (2009): 157-175.

- Resistance exercise can assist in minimizing risk of exercise-induced hypoglycaemia in type 1 diabetes
- Resistance exercise causes less initial decline in blood glucose during the activity but is associated with more prolonged reductions in postexercise glycemia than aerobic exercise

Yardley, Jane E., et al. "Resistance versus aerobic exercise." Diabetes care 36.3 (2013): 537-542.

- Performing resistance exercise before aerobic exercise improves glycemic stability throughout exercise and reduces the duration and severity of postexercise hypoglycemia for individuals with type 1 diabetes
- When resistance and aerobic exercise are undertaken in one exercise session, performing resistance exercise first results in less hypoglycaemia than when aerobic exercise is performed first

Yardley, Jane E., et al. "Effects of performing resistance exercise before versus after aerobic exercise on glycemia in type 1 diabetes." *Diabetes care*35.4 (2012): 669-675.

Structured Exercise

- At least **150 min/week**
- Moderate-intensity aerobic physical activity (50–70% of maximum heart rate)
- Spread **over at least 3** days/week with **no more than 2 consecutive days without** exercise

Exercise Intensity

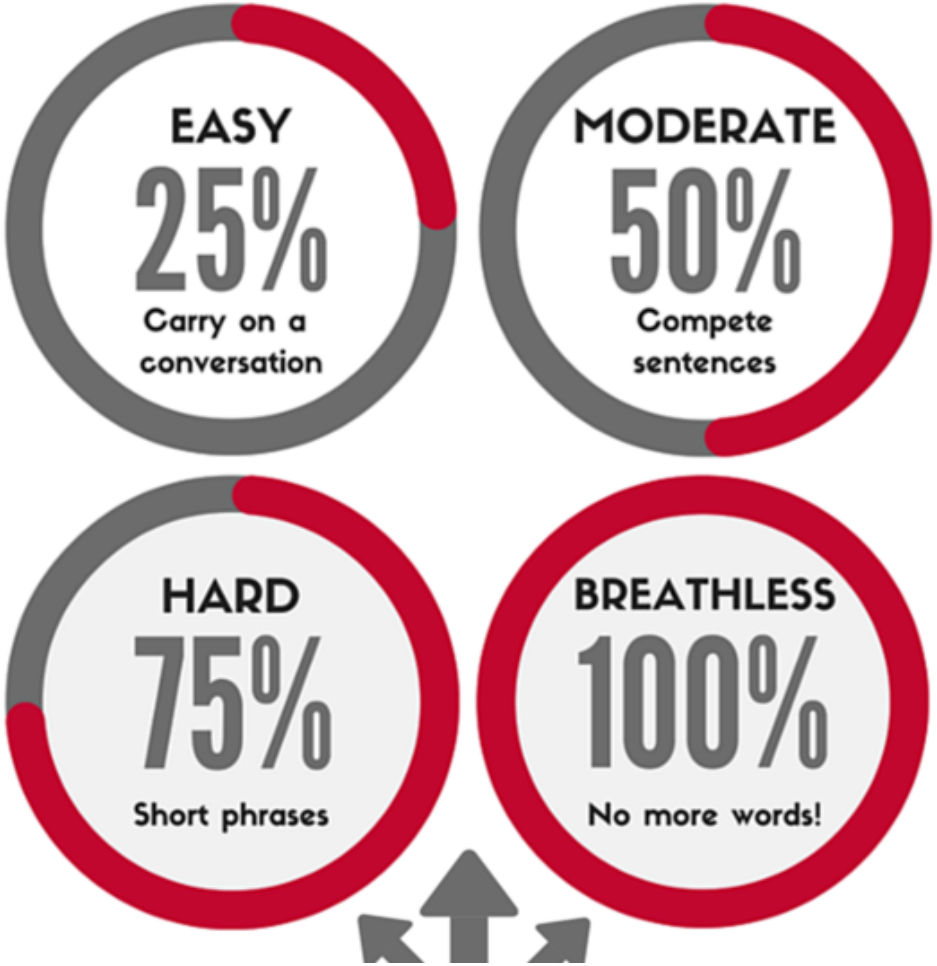
- **Heart Rate:**

Maximum Heart Rate (MHR): 220-Age

Moderate intensity: 50%-70% MHR

  - e.g.: 40 year old male
  - MHR: 220-40=180 bpm
  - 50%-70%=90-126 bpm

Relative Intensity



Flexibility, Balance training

- Flexibility, Balance training:
  - Ages 50 years and older
  - Peripheral neuropathy

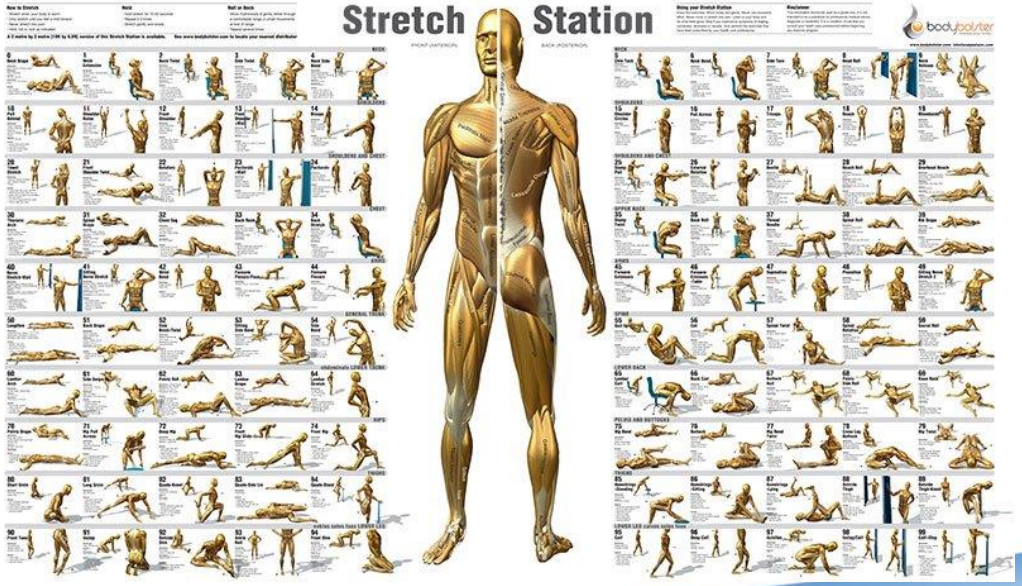
Flexibility Exercise

- Range of motion in joint
- improve muscle tone
- muscular and body control




Recommendation

- **Flexibility** training and **balance** training are recommended 2–3 times/week for older adults with diabetes.
- Yoga and tai chi may be included based on individual preferences to increase flexibility, muscular strength, and balance.



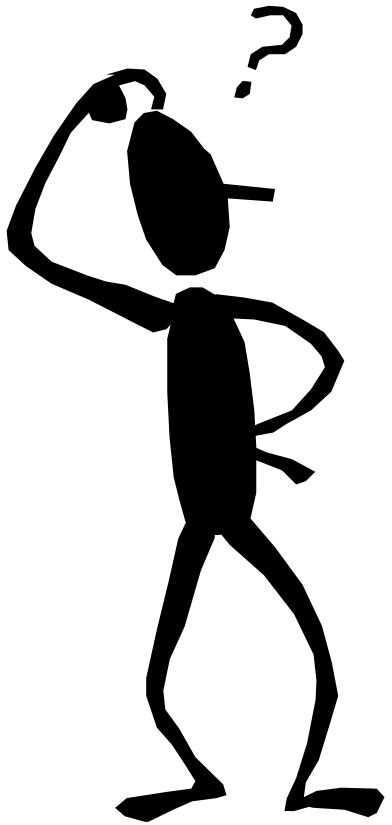
Recommendation

- Children and adolescents with type 1 or type 2 diabetes should engage in 60 min/day or more of moderate or vigorous intensity aerobic activity, with vigorous, muscle-strengthening, and bone-strengthening activities included at least 3 days/week.

Glycemic Balance

Exercise related Adverse events:

- Hypoglycemia
- Nocturnal hypoglycemia
- Hyperglycemia



Factors affecting glucose response to exercise

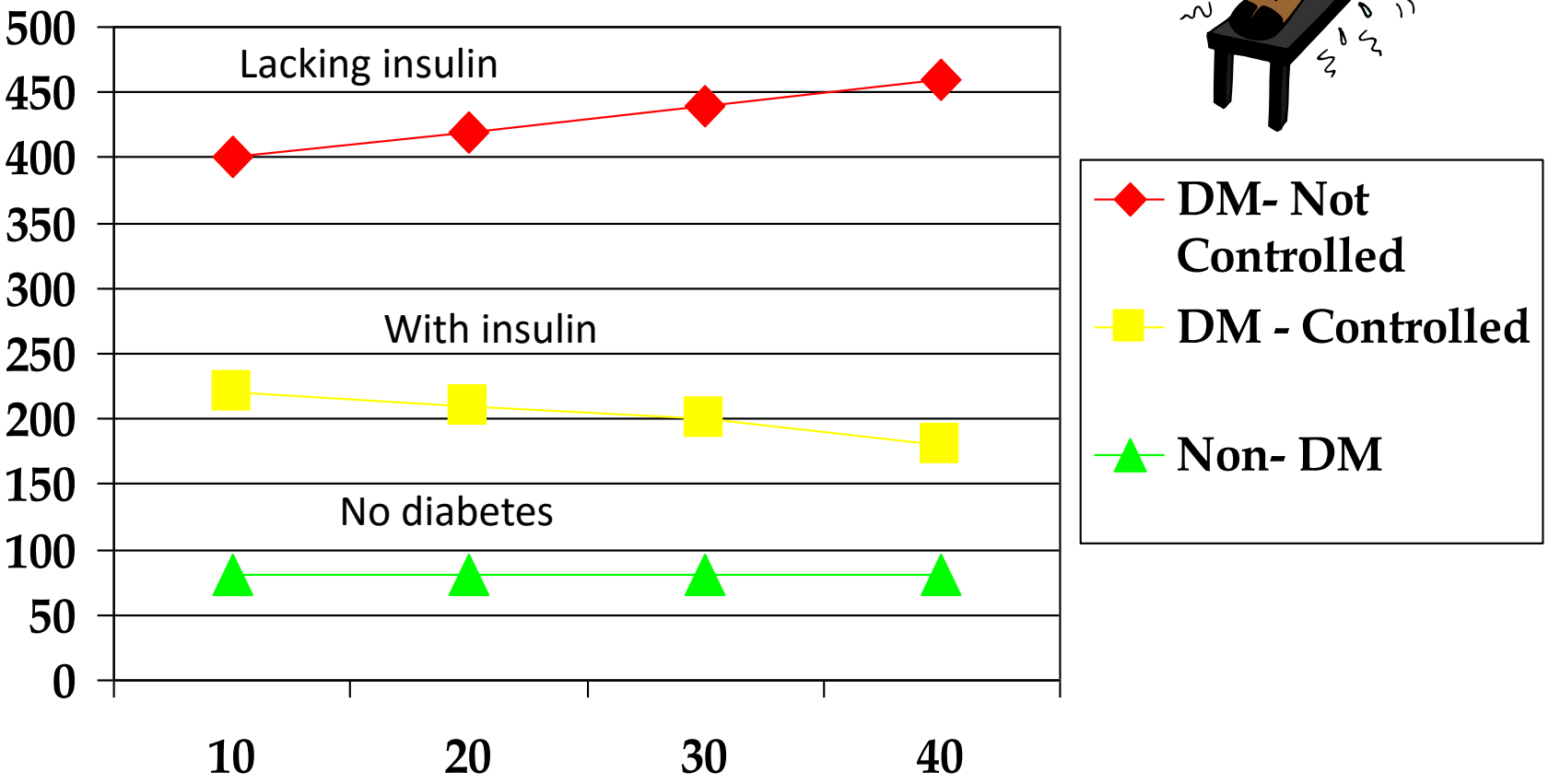
Factors affecting glucose response to exercise

- Types of exercise
- Duration and intensity
- Timing of the exercise
- Conditioning
- Degree of stress/competition
- Metabolic control

Aerobic activities

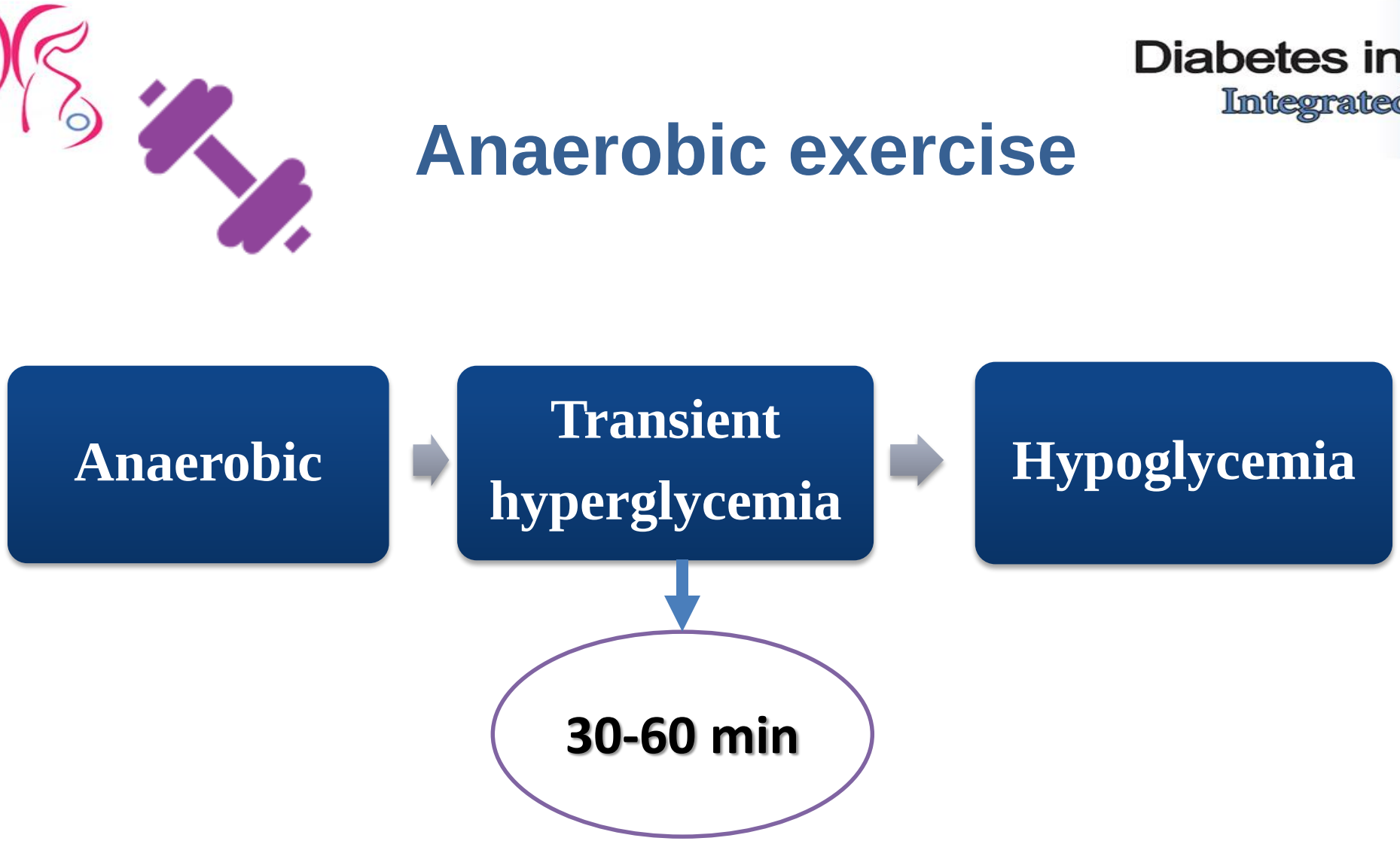
Aerobic → Hypoglycemia (during & after) → ↑ insulin sensitivity

Effect of Exercise on Blood Sugar Levels

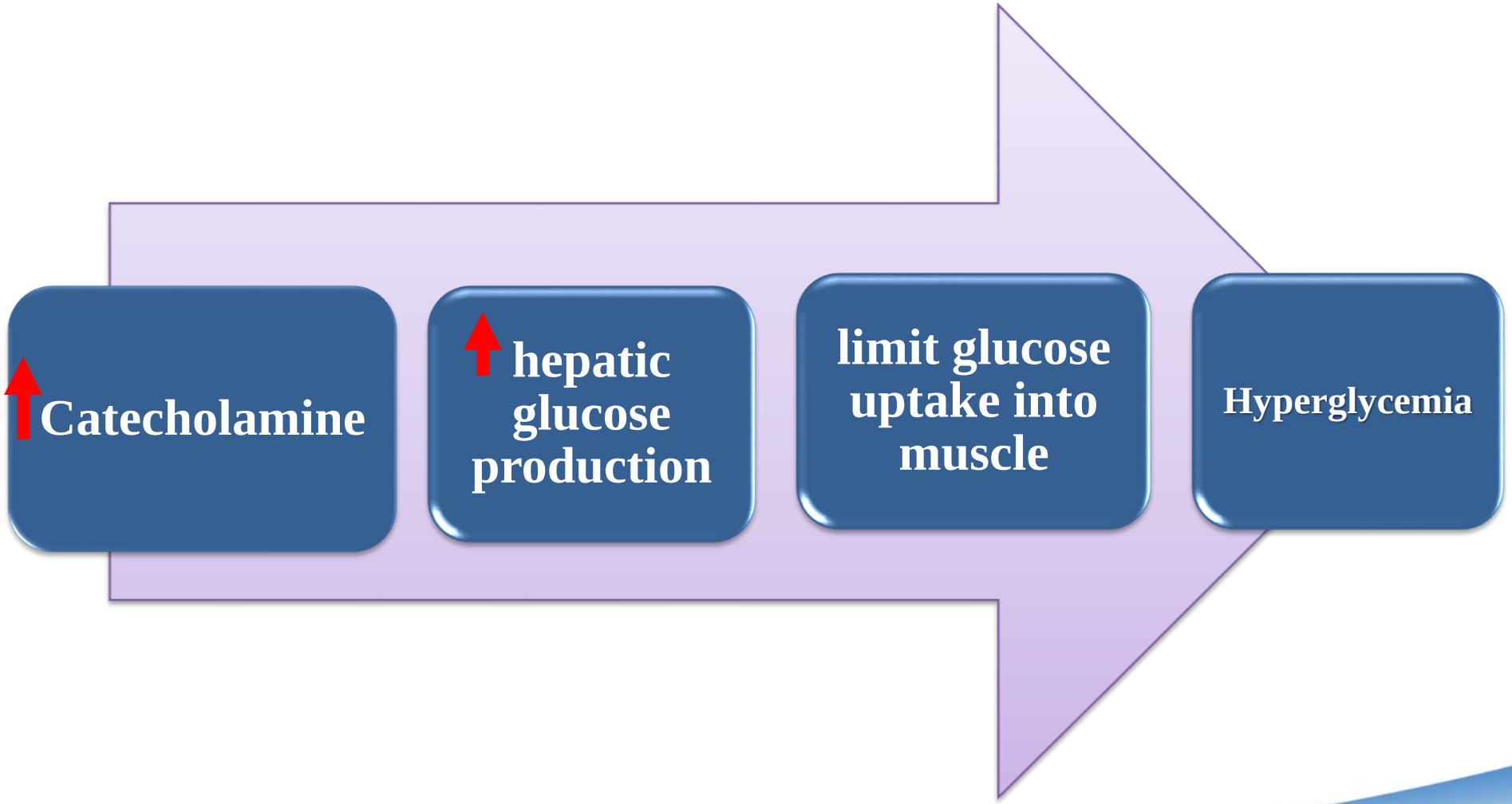


Joslin Medical Publication

Anaerobic exercise



Intense exercise



Tips for starting exercise

Check-up :

- Cardiovascular
- Peripheral arterial disease
- Neuropathy
- Foot exam
- Nephropathy
- Blood pressure
- Retinopathy

Tips for starting exercise

- Start slowly, perhaps 5-10 minutes at a time, especially sedentary individuals
- Warm-up
- Cool down
- Drink water
- Appropriate footwear

Neuropathy

Recommended	Contraindicated
Non-weight-bearing activities	Weight-bearing activities
Swimming	Prolonged walking
Cycling (a stationary/exercise bike)	Jogging
Rowing	Step exercises
Chair and arm exercises	Treadmill

Nephropathy

Recommended	Contraindicated
Low to moderate intensity forms of exercise	High intensity forms of exercise

Exercise can acutely increase urinary protein excretion

Diabetic Retinopathy

Recommended	Contraindicated
Swimming	weight lifting
Walking	Jogging
Stationary cycling	High-impact aerobics
Endurance exercises	Isometric exercise
	Racquet sports