

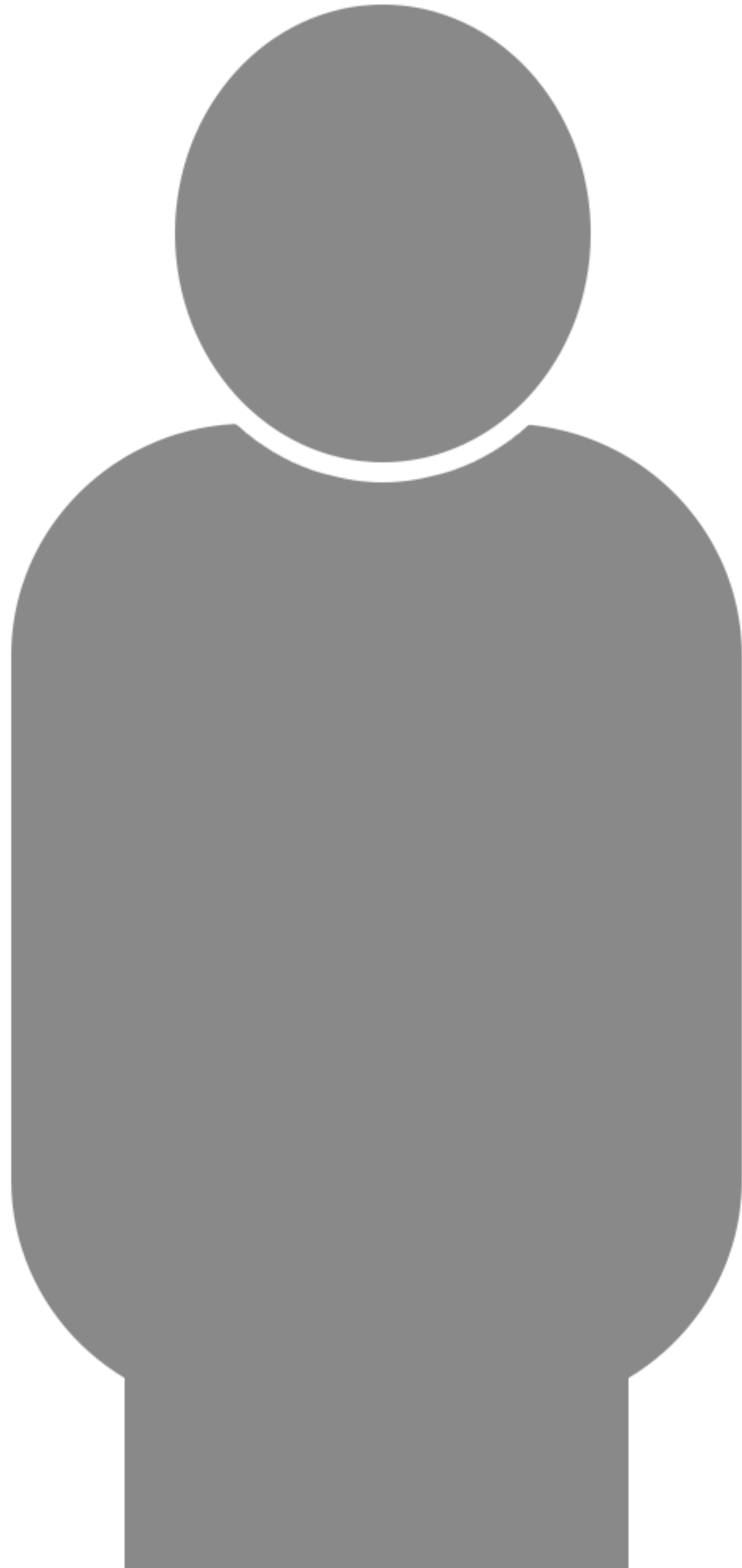
Exercise and the FreeStyle Libre

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Supported by a restricted educational grant from Abbott





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Consultant in Birmingham

T1D

DAFNE lead

Insulin pumps

CGM

DAFNE Executive board member

Disclosures:

Speaker and Advisory board fees from Lilly Diabetes, Abbott, Astra Zeneca

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Consultant in Taunton

T1D and exercise

DAFNE trained

Insulin pumps

CGM

Disclosures:

Speaker and Advisory board fees from Novo Nordisk, Sanofi, Astra Zeneca



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Learning objectives

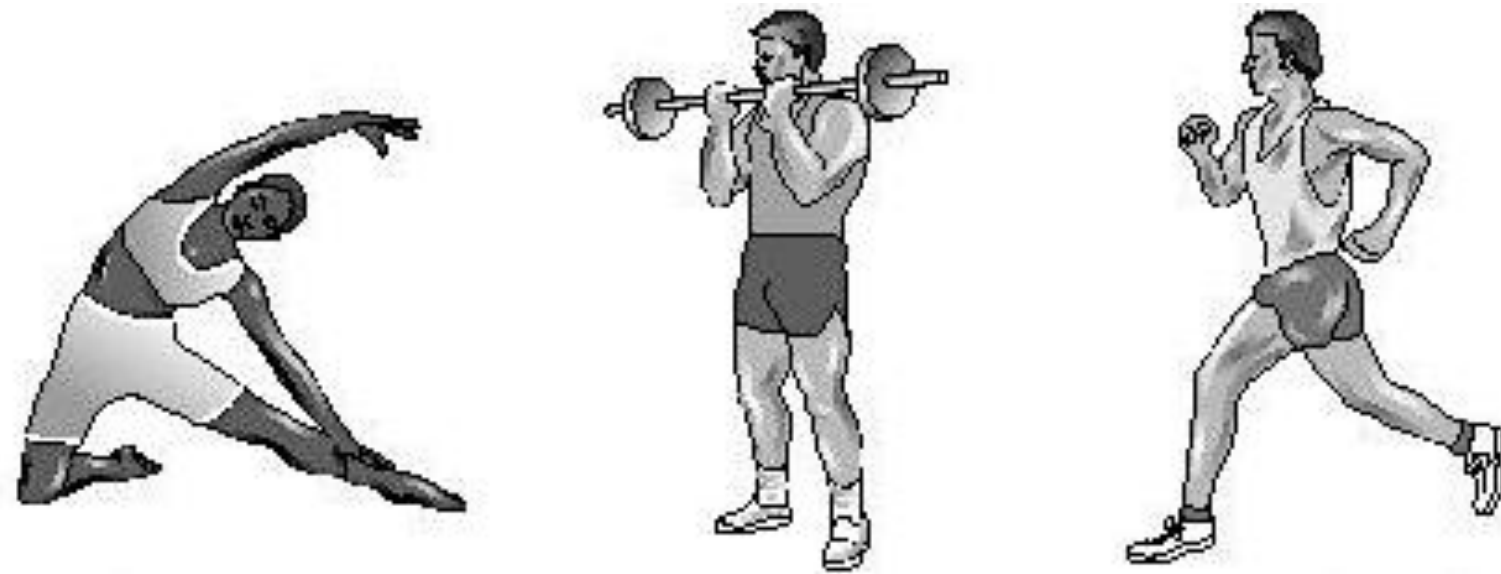
1. What you need to think about before you exercise
2. What options are available for managing glucose during exercise
3. What options are available for managing glucose after exercise
4. How the libre can help to manage glucose levels before, during and after exercise



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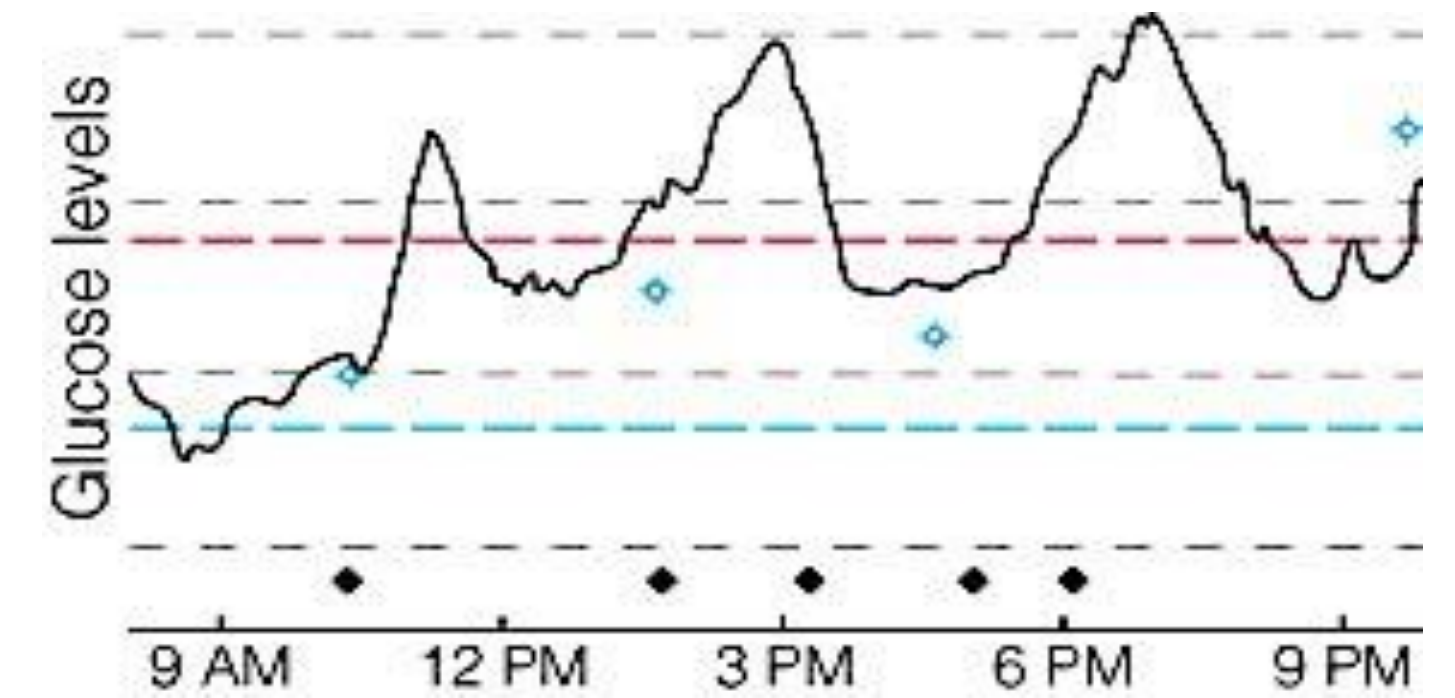
Considering exercise – three things to think about



What exercise you are going to do?



What time you will exercise?



What has your Glucose level been in the last 24 hrs and what is it at the start of exercise?



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The exercise – three things you need to know

- What type of exercise are you going to do?
- What will the intensity of the exercise be?
- How long will you exercise for?



Three types of exercise



AEROBIC

Hiking
Golf
Road cycling
Cycle tour
Mountain biking
Distance running
Distance swimming
Marathon



ANAEROBIC

Weight lifting
Body Building
Dressage
Fencing
Track and field events
Sprinting
Archery
Wrestling



FLEXIBILITY

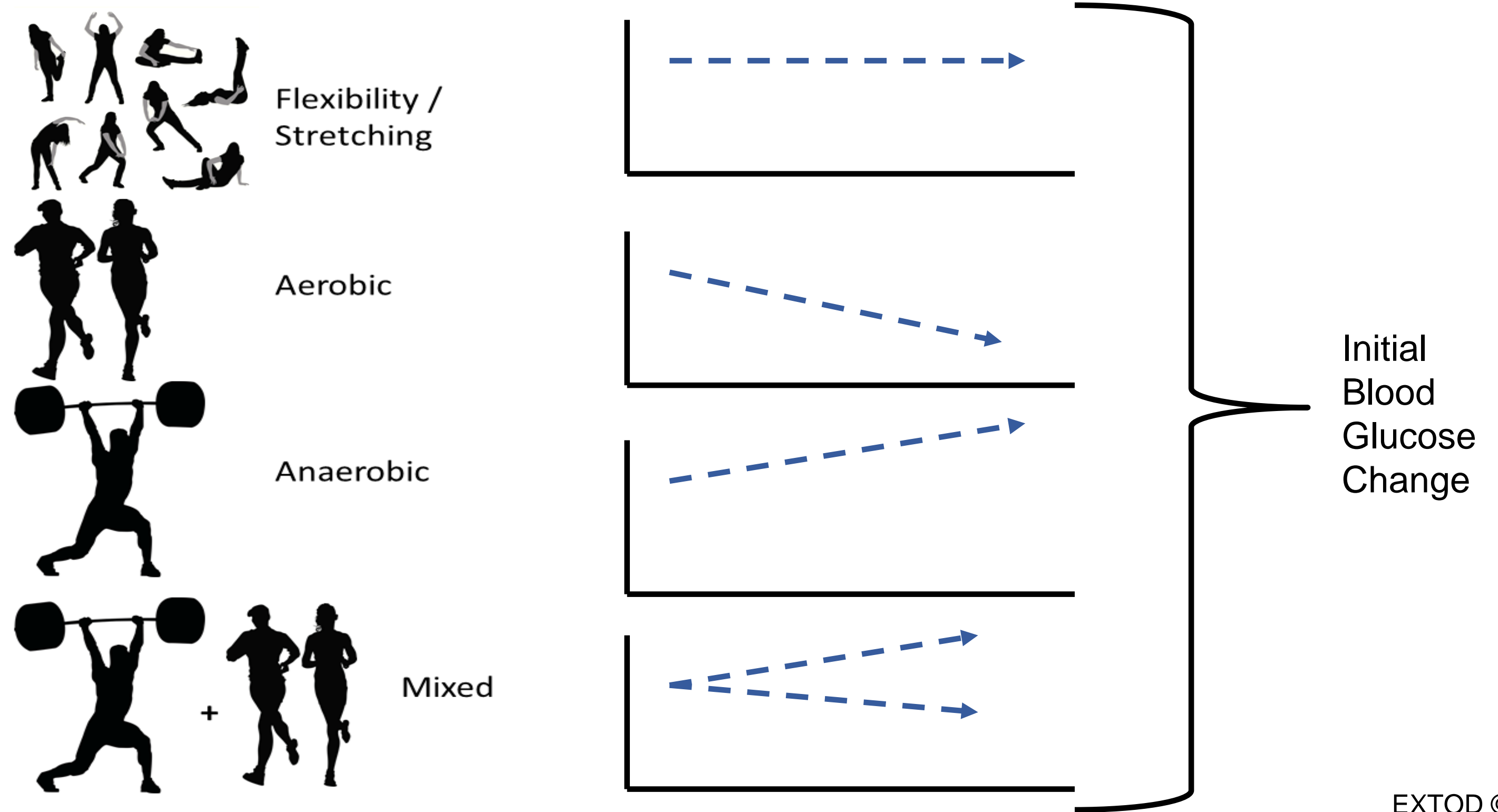
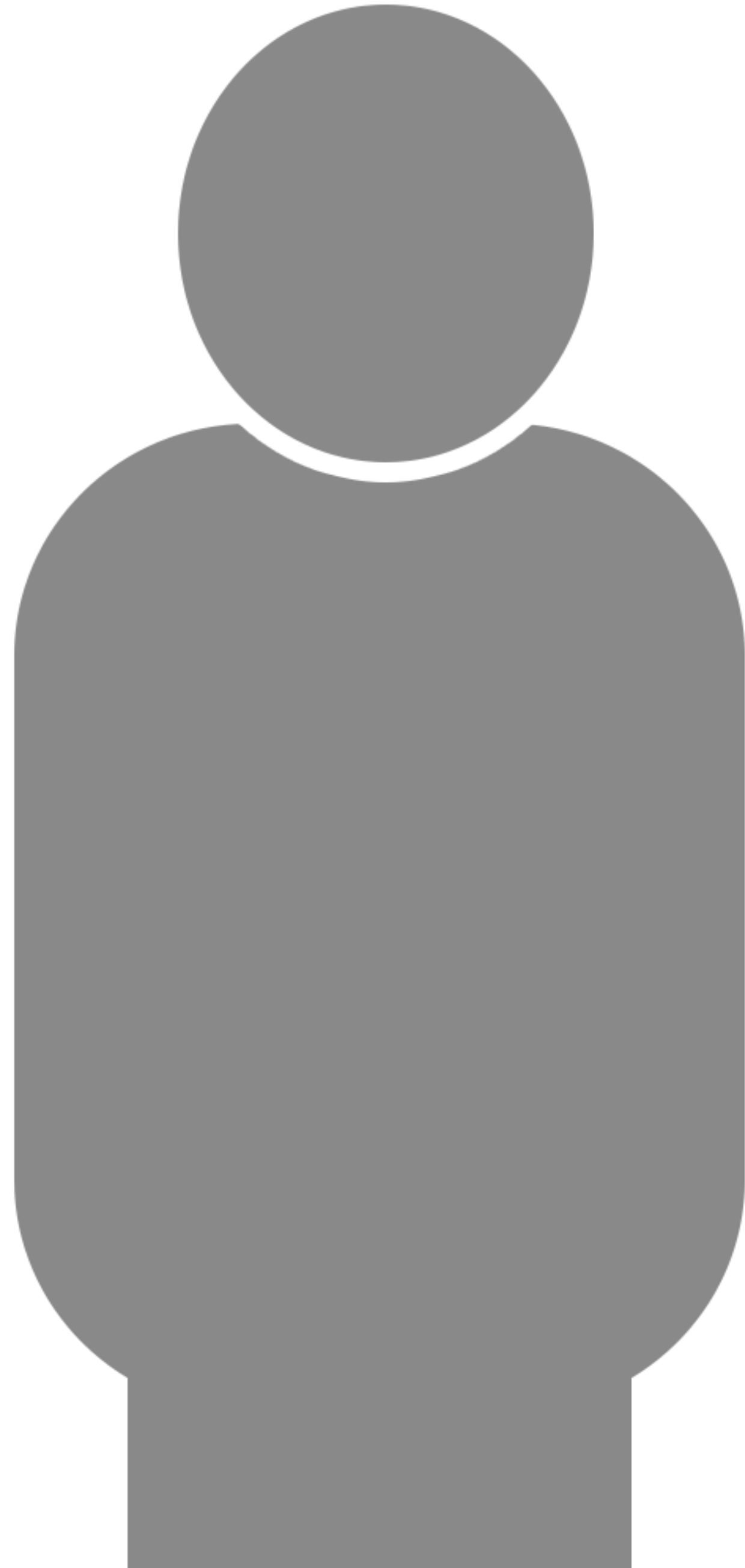
Stretching
Yoga



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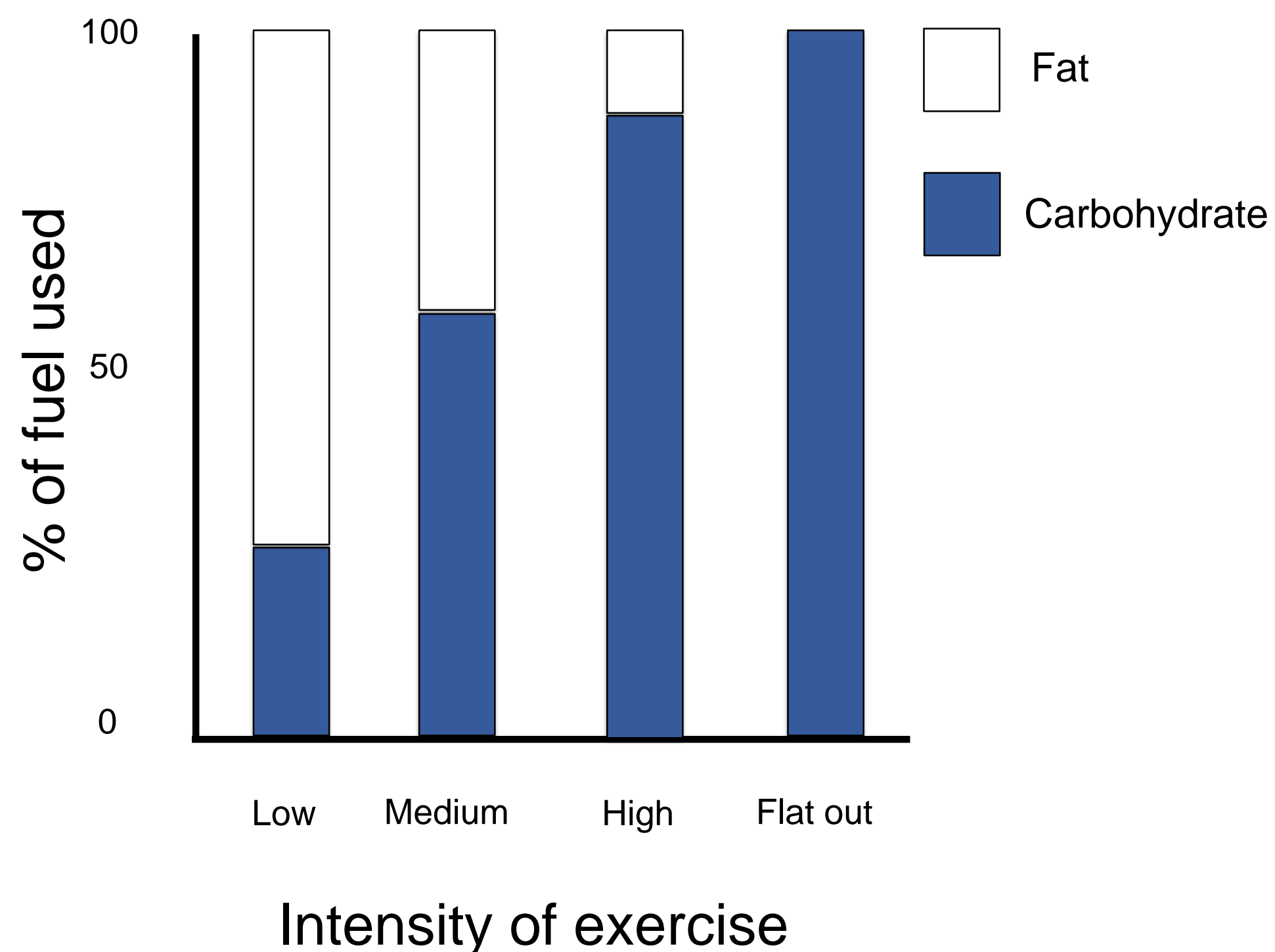


Glucose responses to different exercises in T1D



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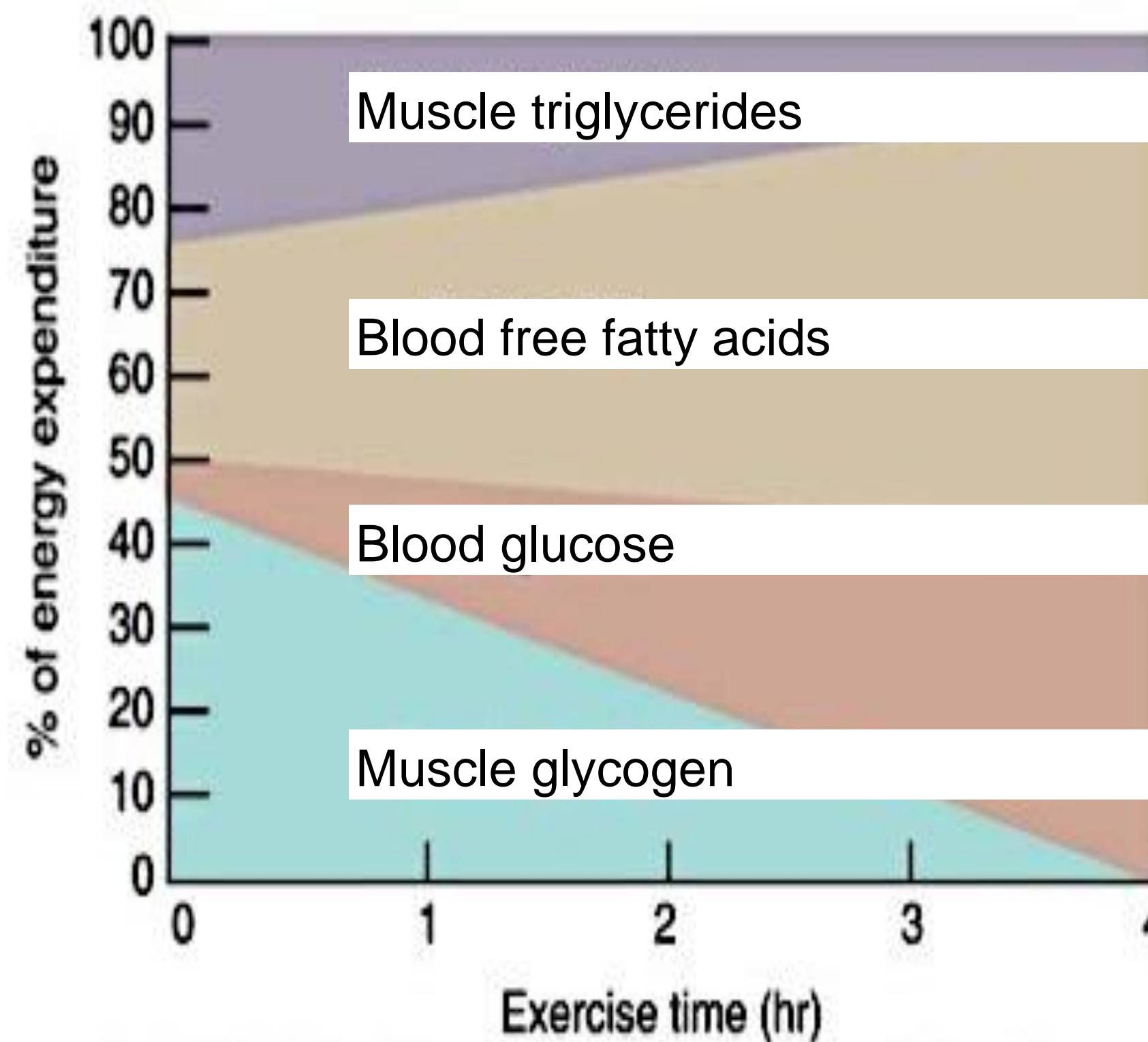
Intensity of exercise



- Glucose is used at all intensities of exercise
- At low intensity the main fuel used is fat
- At high intensity the main fuel used is glucose

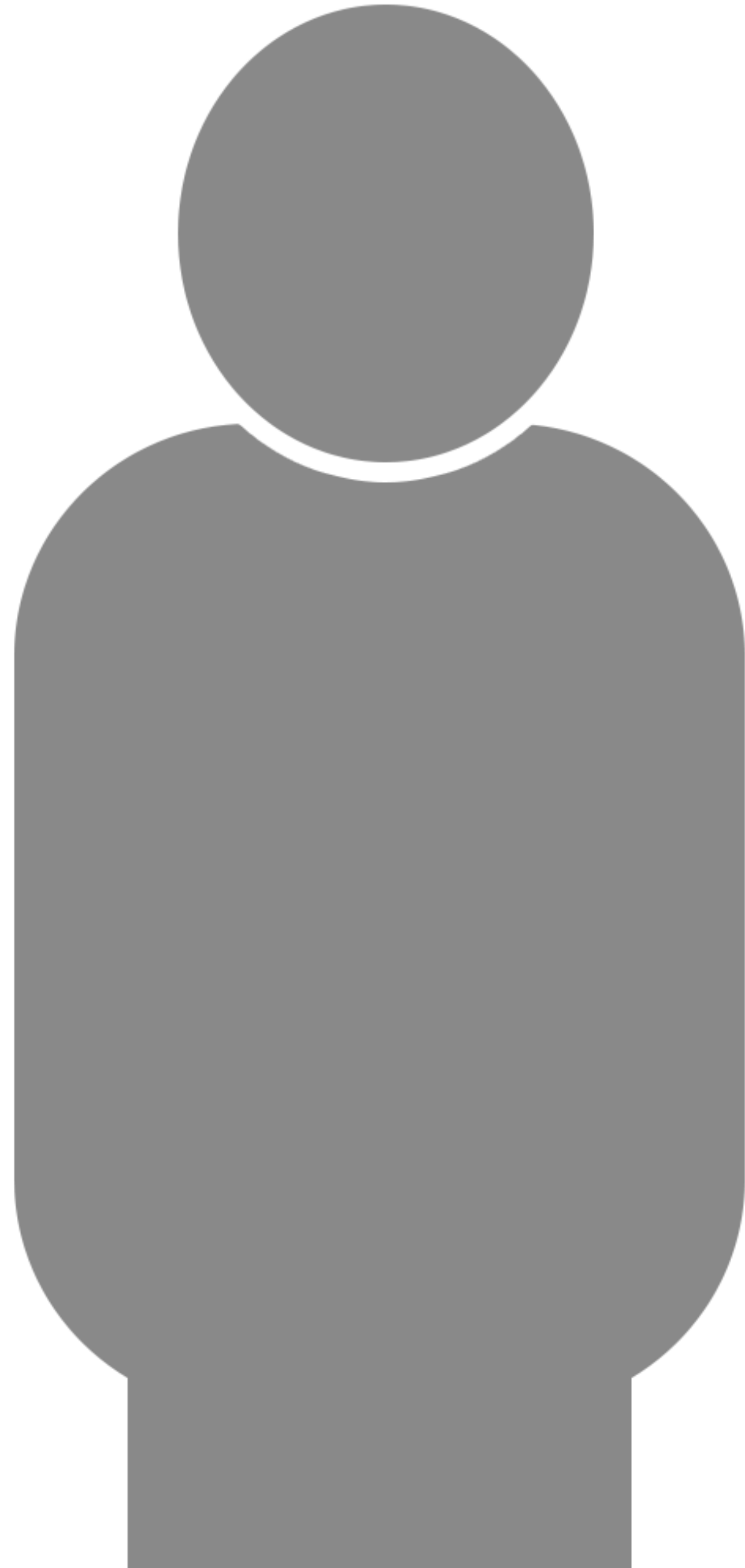
Romijn *et al.*, *Am J Physiol* 1993; Van Loon *et al.*, *J Physiol* 2001

Length of exercise



- Little blood glucose used during first 30mins of exercise
- More blood glucose used with longer duration exercise

Romijn *et al.*, *Am J Physiol* 1993; Van Loon *et al.*, *J Physiol* 2001



Time of day – three things to think about

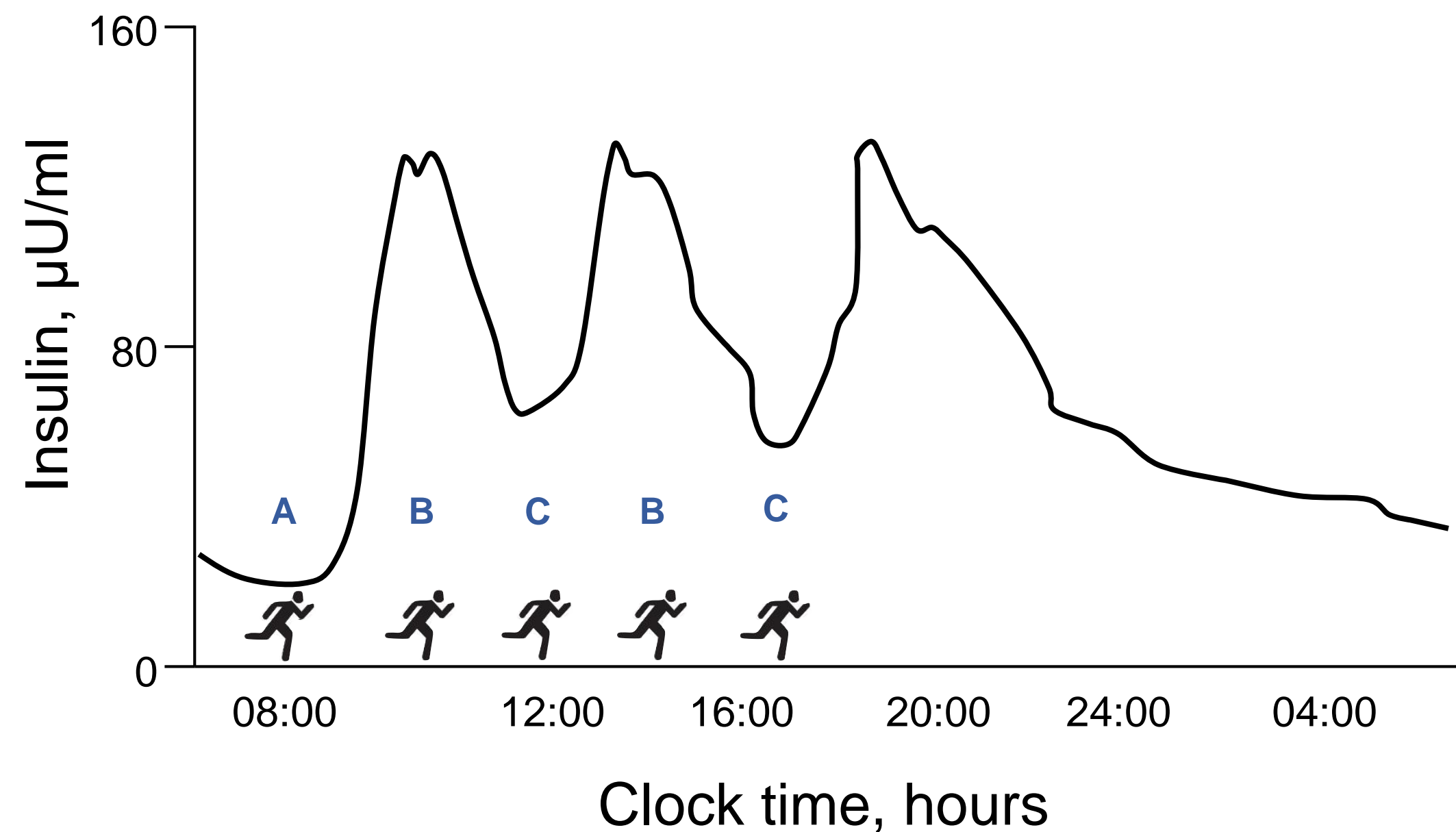
- How much insulin do you have on board?
- When did you last eat?
- Are you exercising in the morning or afternoon?



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Prevailing insulin levels



- A. Lowest insulin level on waking (pre-breakfast): lowest risk of hypoglycaemia here
- B. Within 2 hour window of fast acting insulin: highest risk of hypoglycaemia here
- C. After fast acting insulin: second lowest insulin level - low risk of hypoglycaemia

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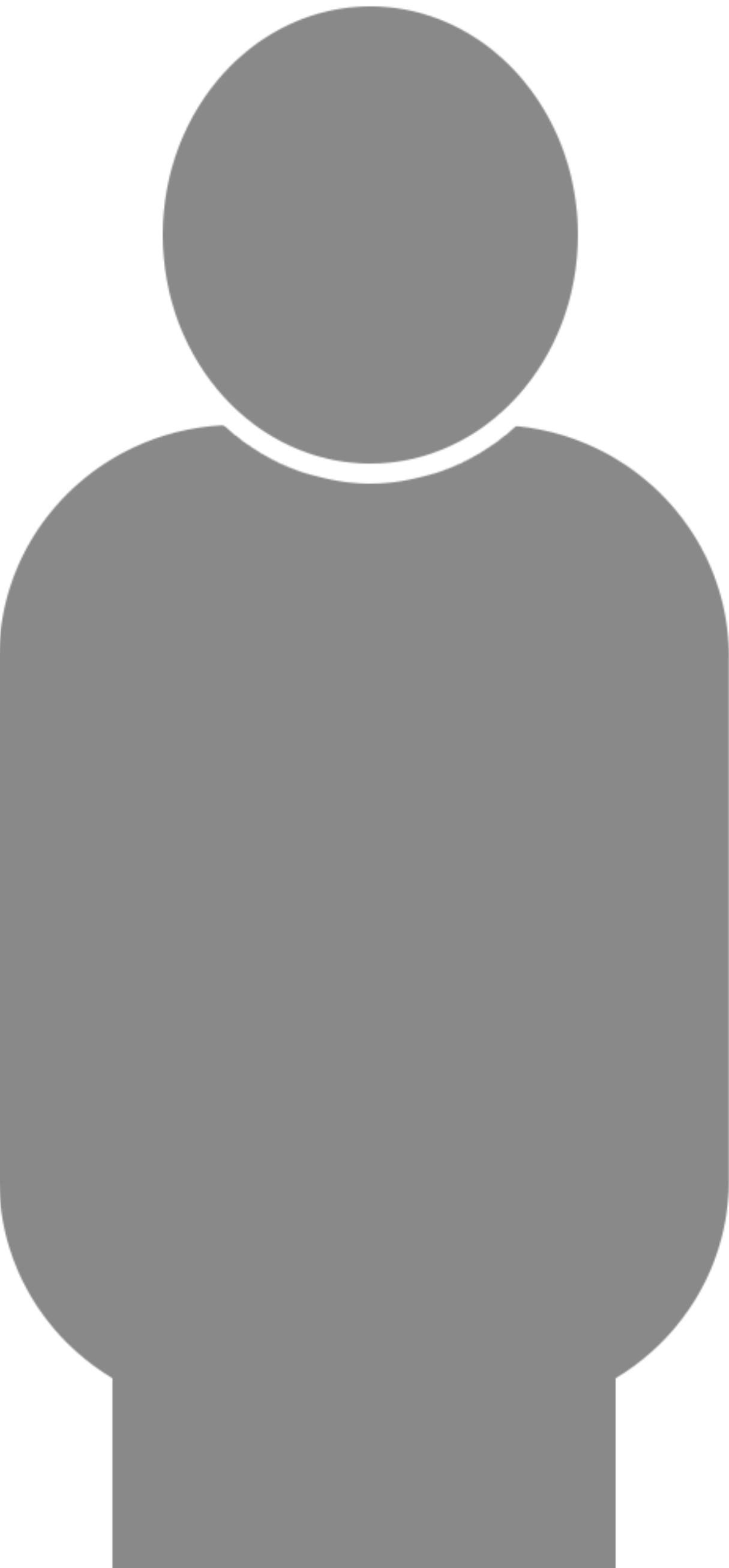
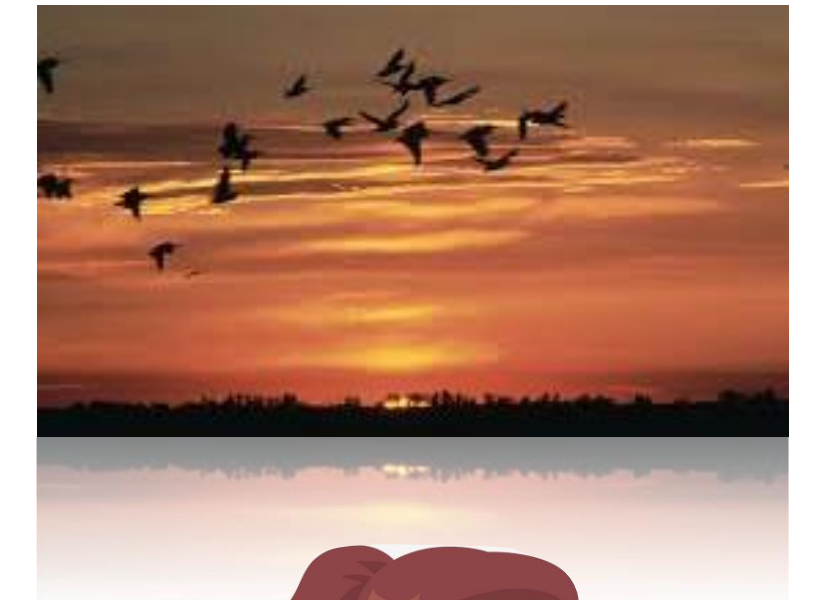
Morning or afternoon exercise?



Greater risk of hypo if exercise undertaken after 4pm

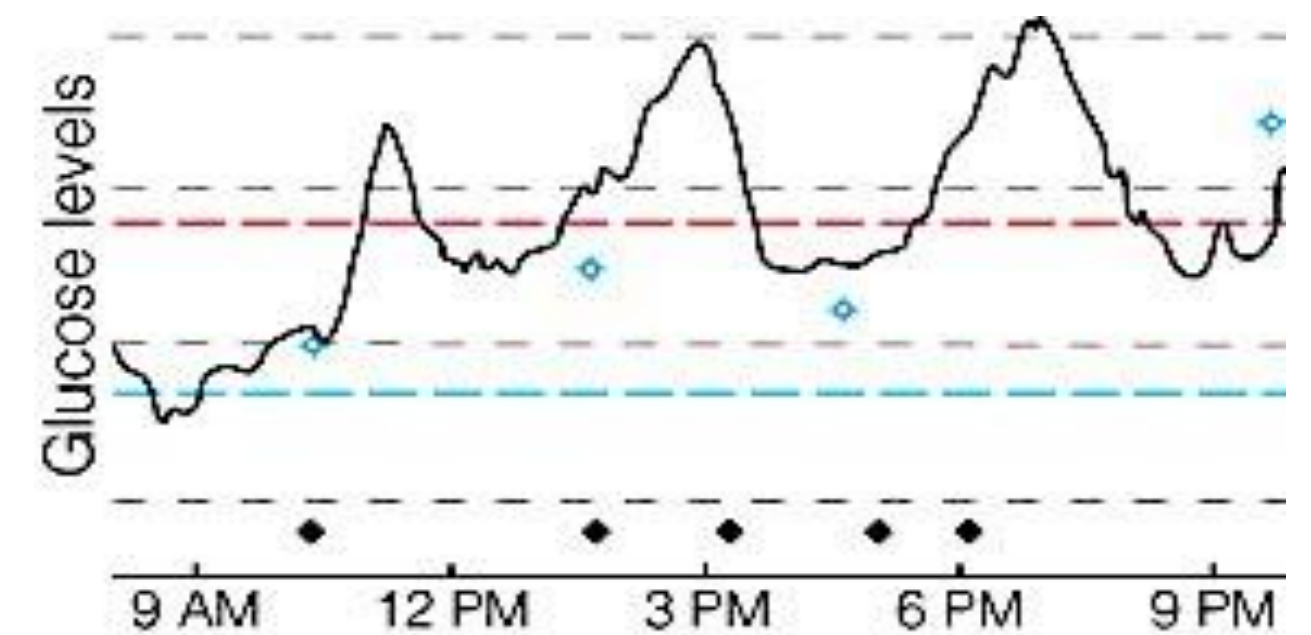
Insulin resistance

Wakefulness



Glucose level– three things to think about

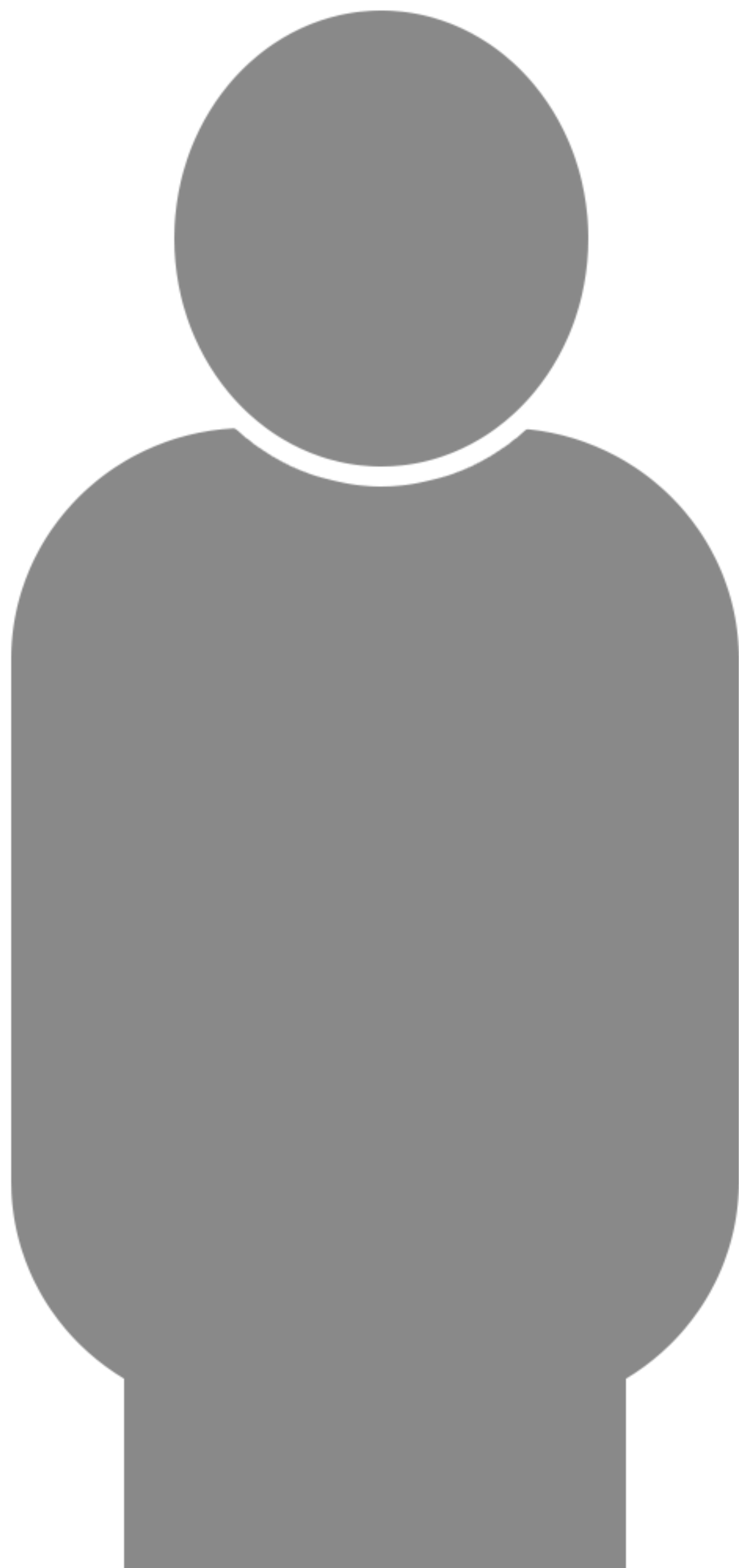
- Have you had a hypo in the last 24 hours?
- What has been happening to your glucose in last hour?
- What is your current glucose?



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Hypoglycaemia and exercise



Type of hypo	Risk of hypo with exercise
Severe hypoglycaemic episode (needed help from someone else) in last 24 hours.	Risk of hypoglycaemia with exercise and after exercise is very high. Advice is not to exercise on that day
Hypoglycaemic episode self treated in last 24 hours.	Higher risk of hypoglycaemia with exercise and after exercise Advice is to <ol style="list-style-type: none">1. Not to do lone events/ training2. Monitor more frequently3. Check glucose overnight



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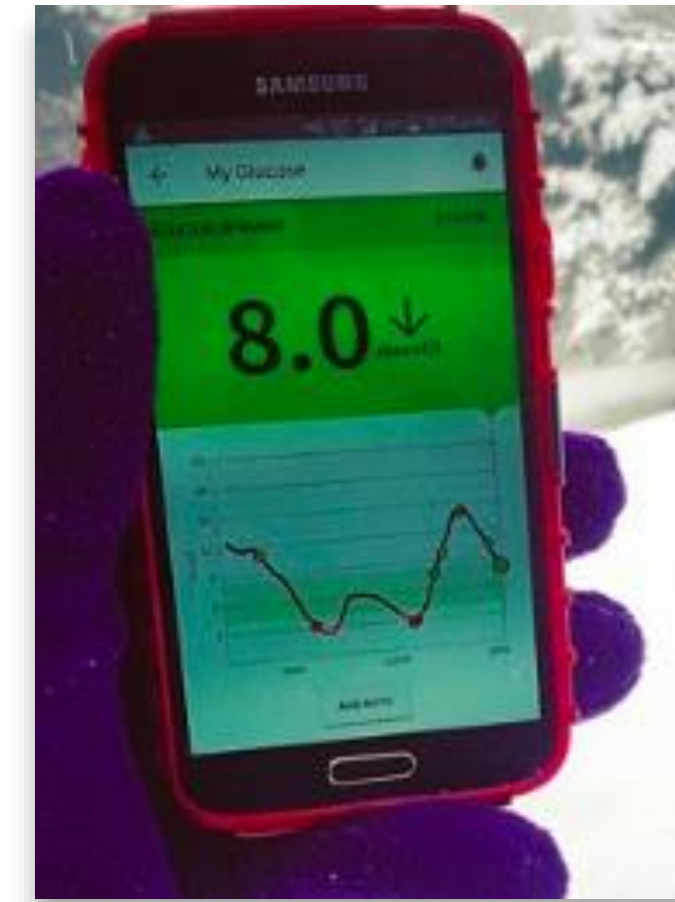


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Direction of glucose

Although both have of these show glucoses in target range for exercise, response to exercise is likely to be different

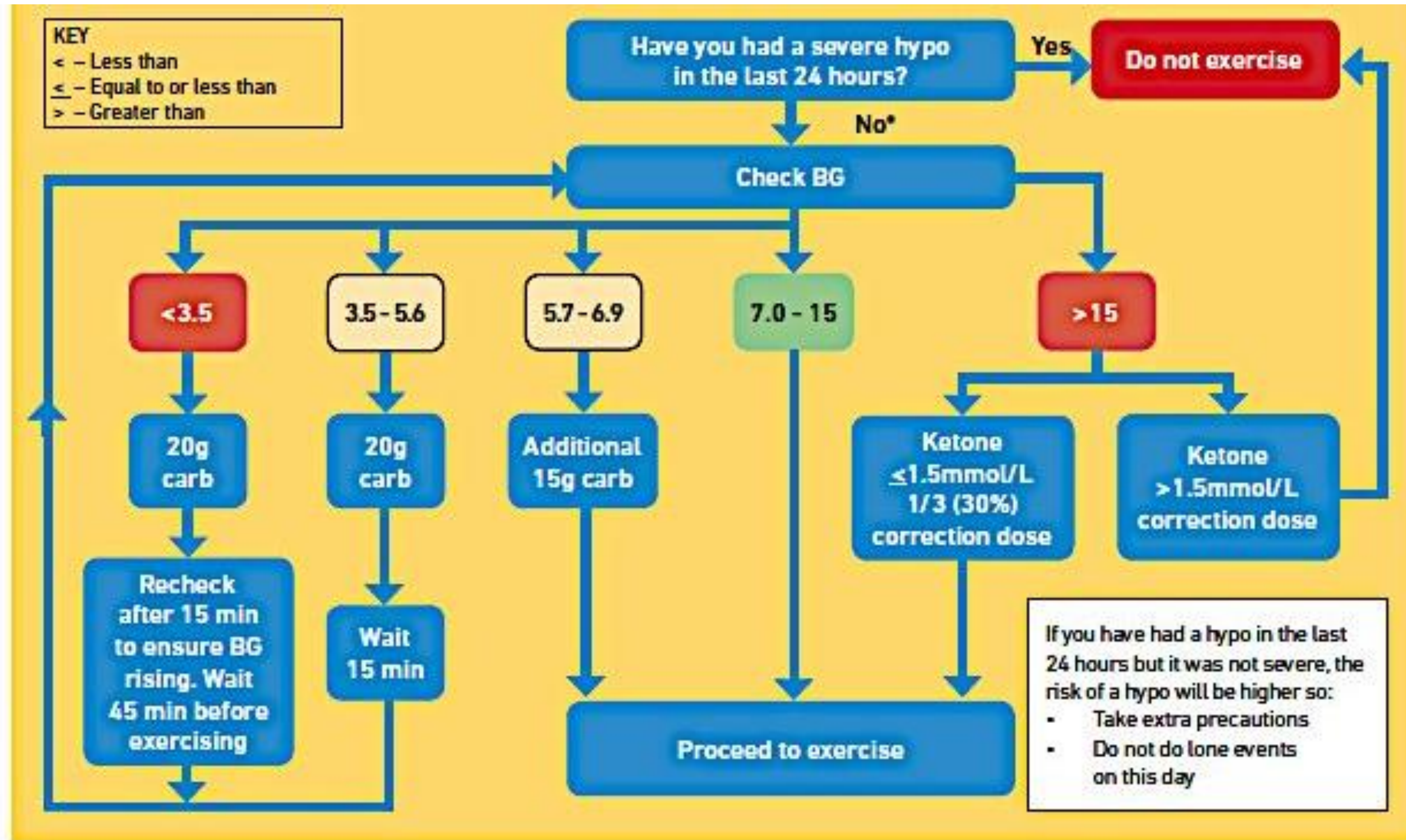
Libre enables you to see direction of travel



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Simple flowchart for glucose and exercise



Addition information for Libre

Confirm with BG reading if

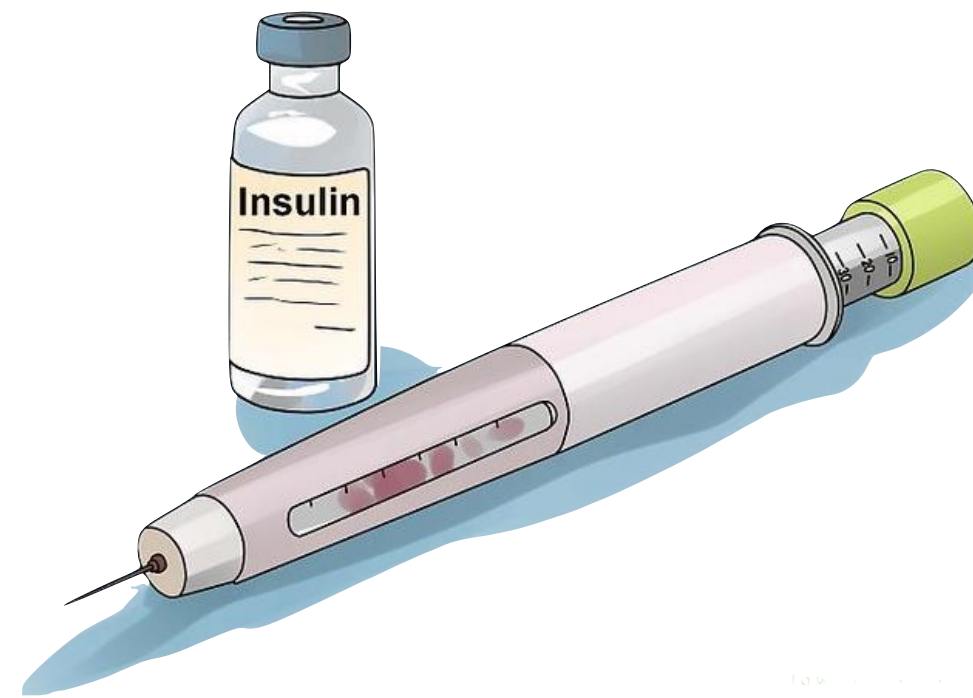
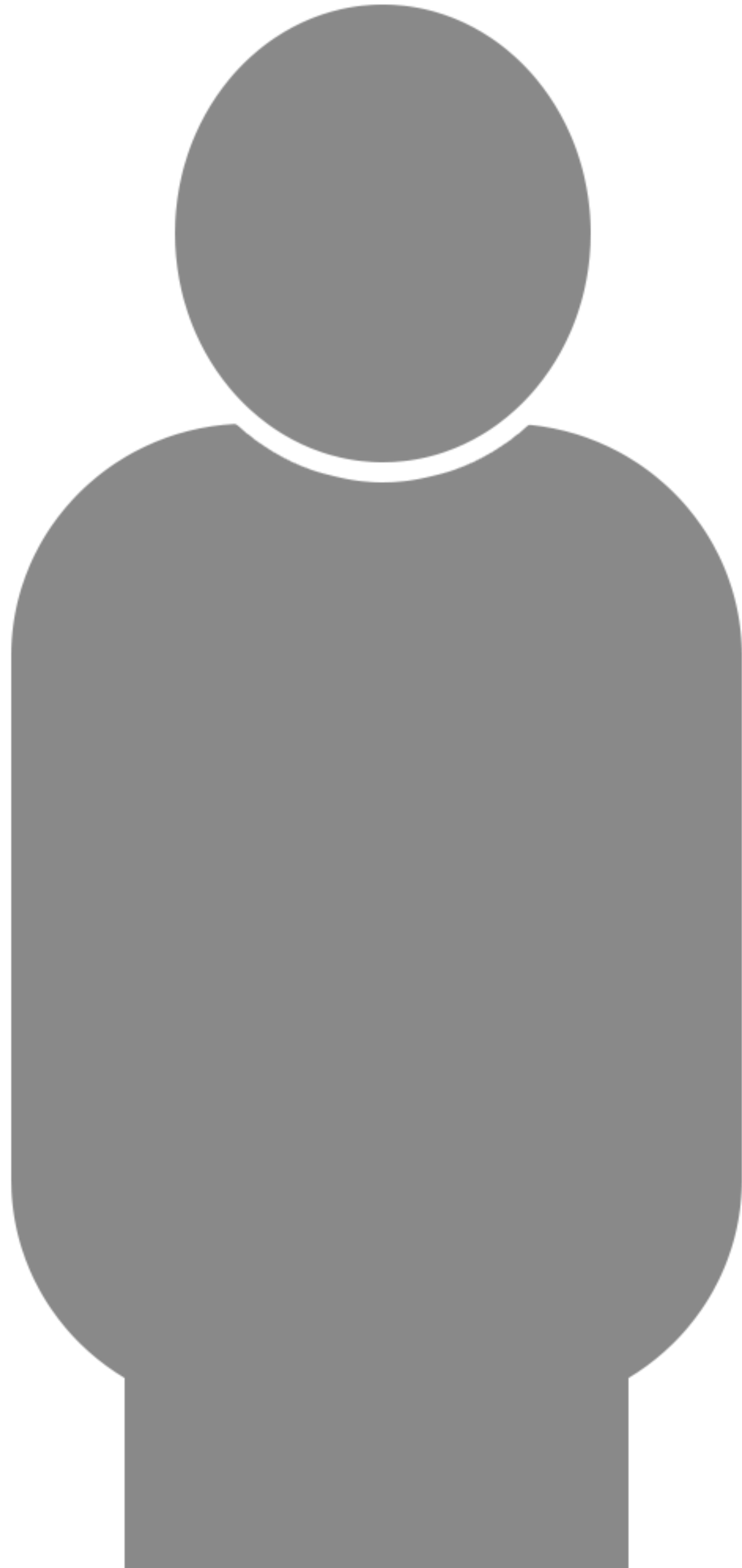
- Glucose <6.0
- Glucose >15

If ↑ and glucose 5.7-6.9: no need for extra carbs, proceed to exercise. Stick to advice if in any other range

If ↓ and glucose 5.7-6.9: take twice as much carbs at 20 and 40 minutes into exercise

If ↓ and glucose 7.0-9.0: take 15 grams of carbs at start of exercise

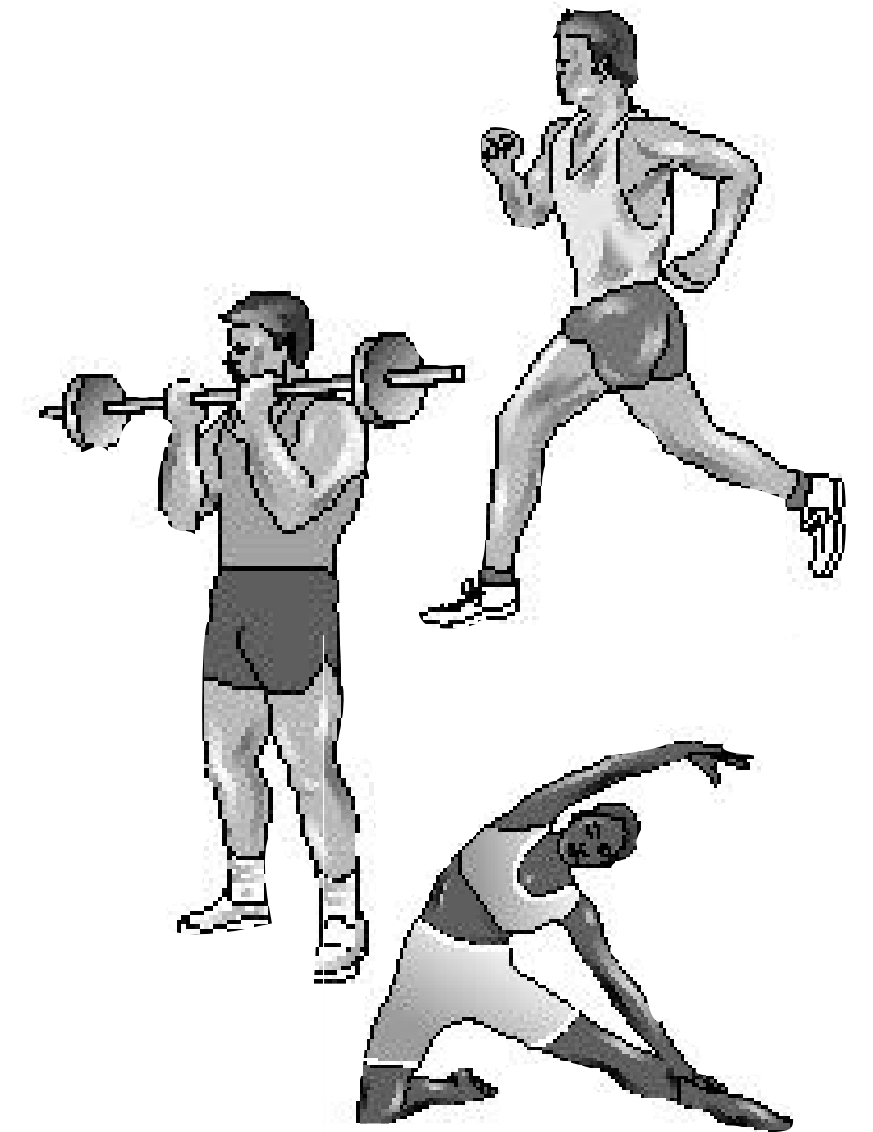
Three ways to manage glucose during exercise



Insulin



Carbohydrate



Exercise

Using insulin to manage glucose during exercise

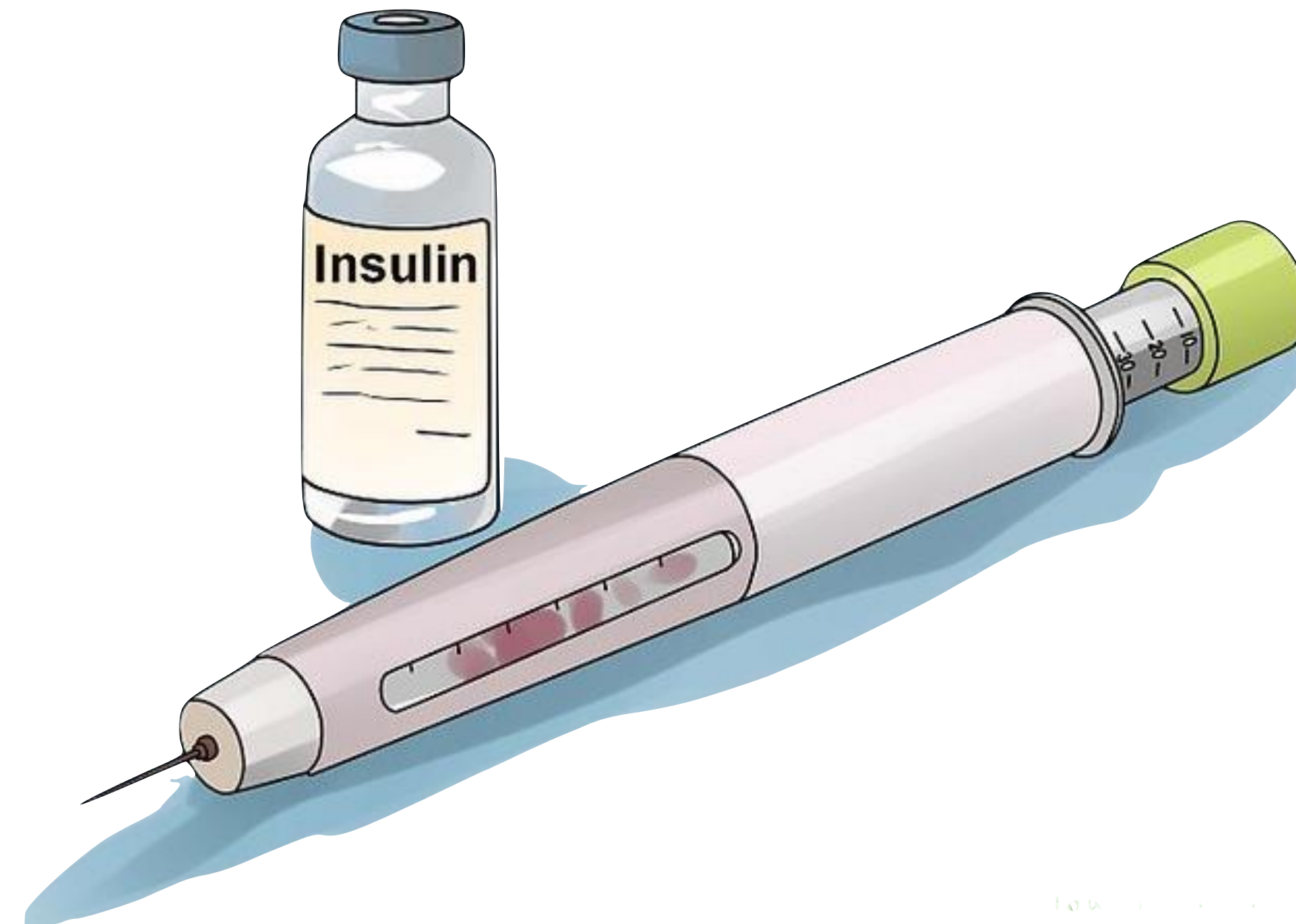


Image: iStockphoto.com



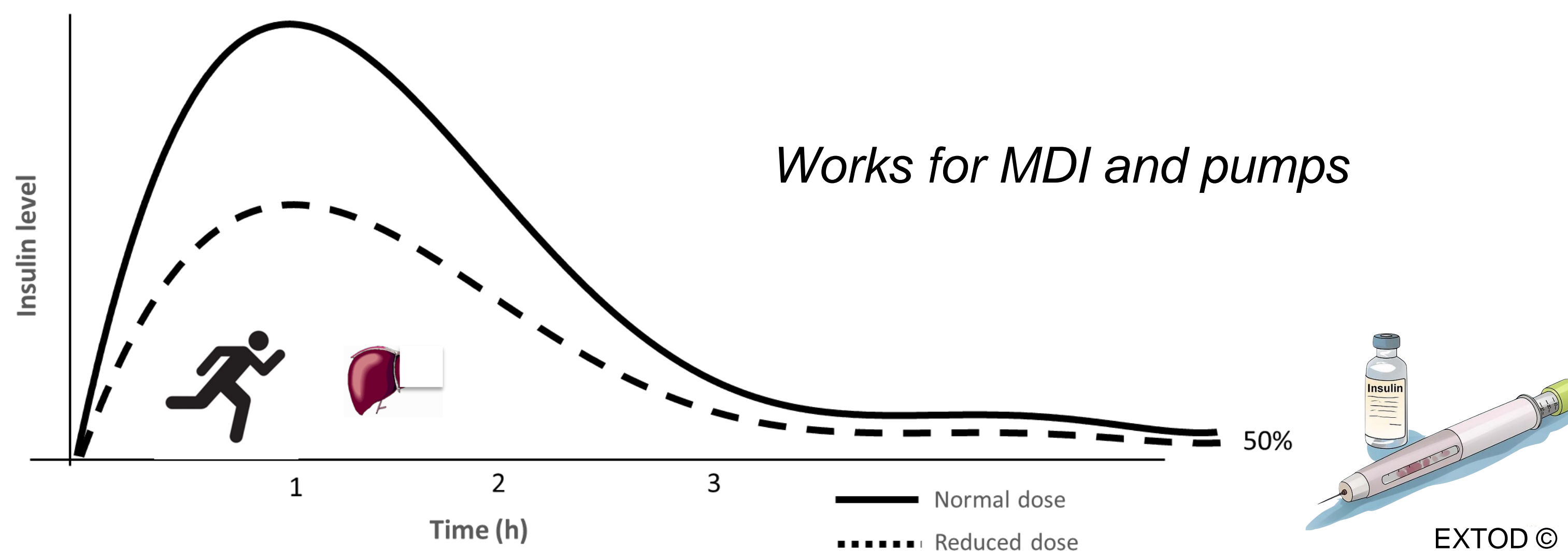
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Simple strategy for meal-insulin

If exercising within 2 hours of quick acting (bolus) insulin

- Reduce pre-exercise quick acting (bolus) insulin by 50%
- Use Libre results to adjust reduction going forward

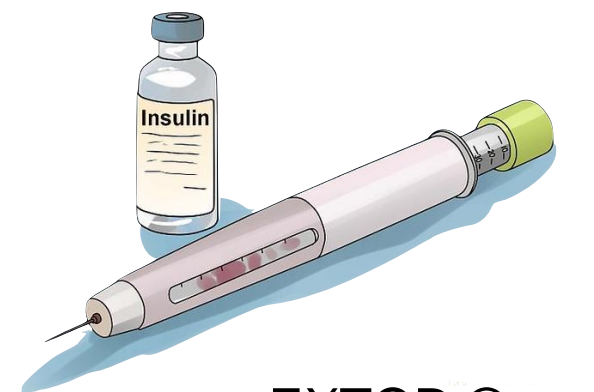


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Simple strategy for basal insulin on pumps

- Reduce basal insulin by 50% one hour before starting exercise
- Return to usual basal rate at the end of exercise
- Use Libre results to adjust reduction going forward

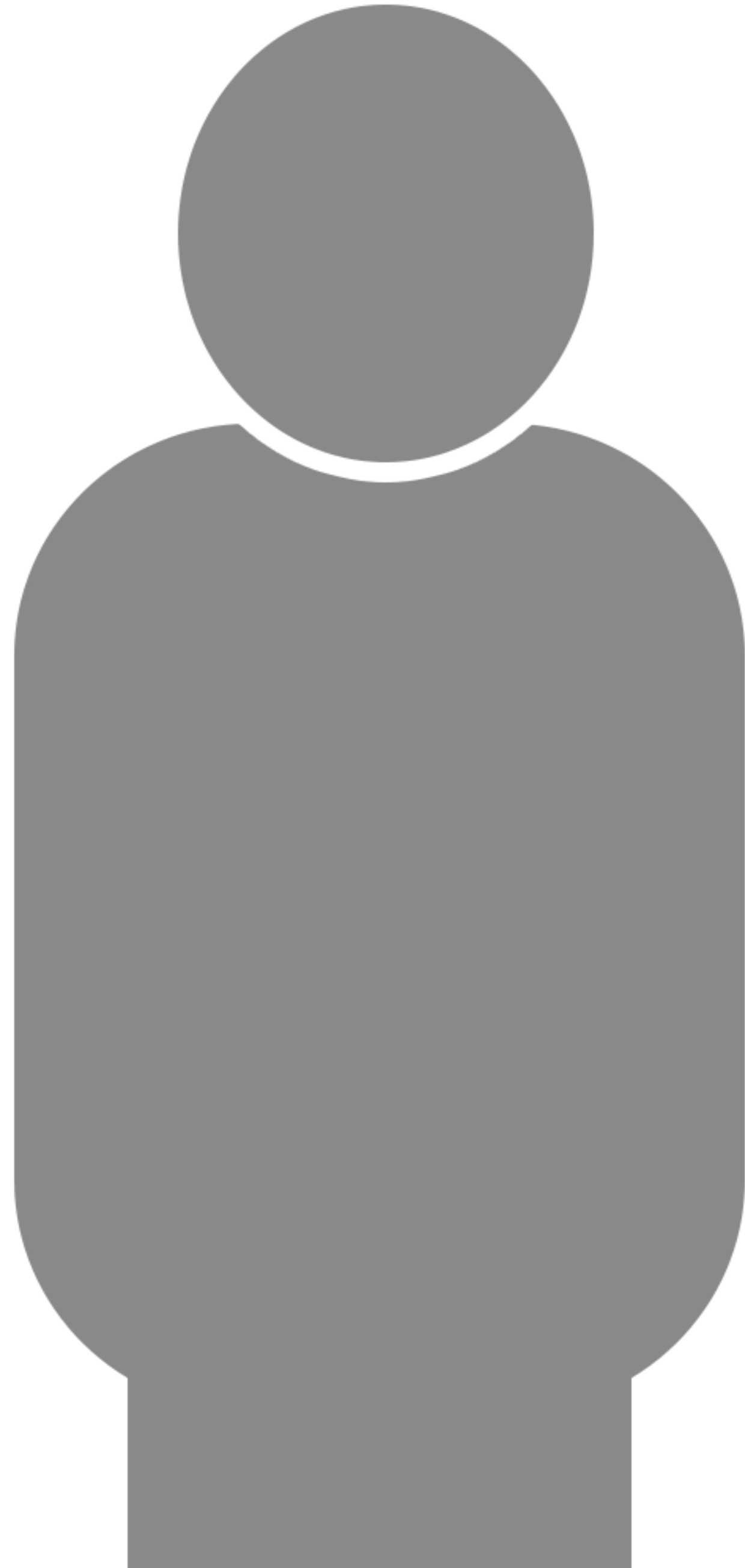


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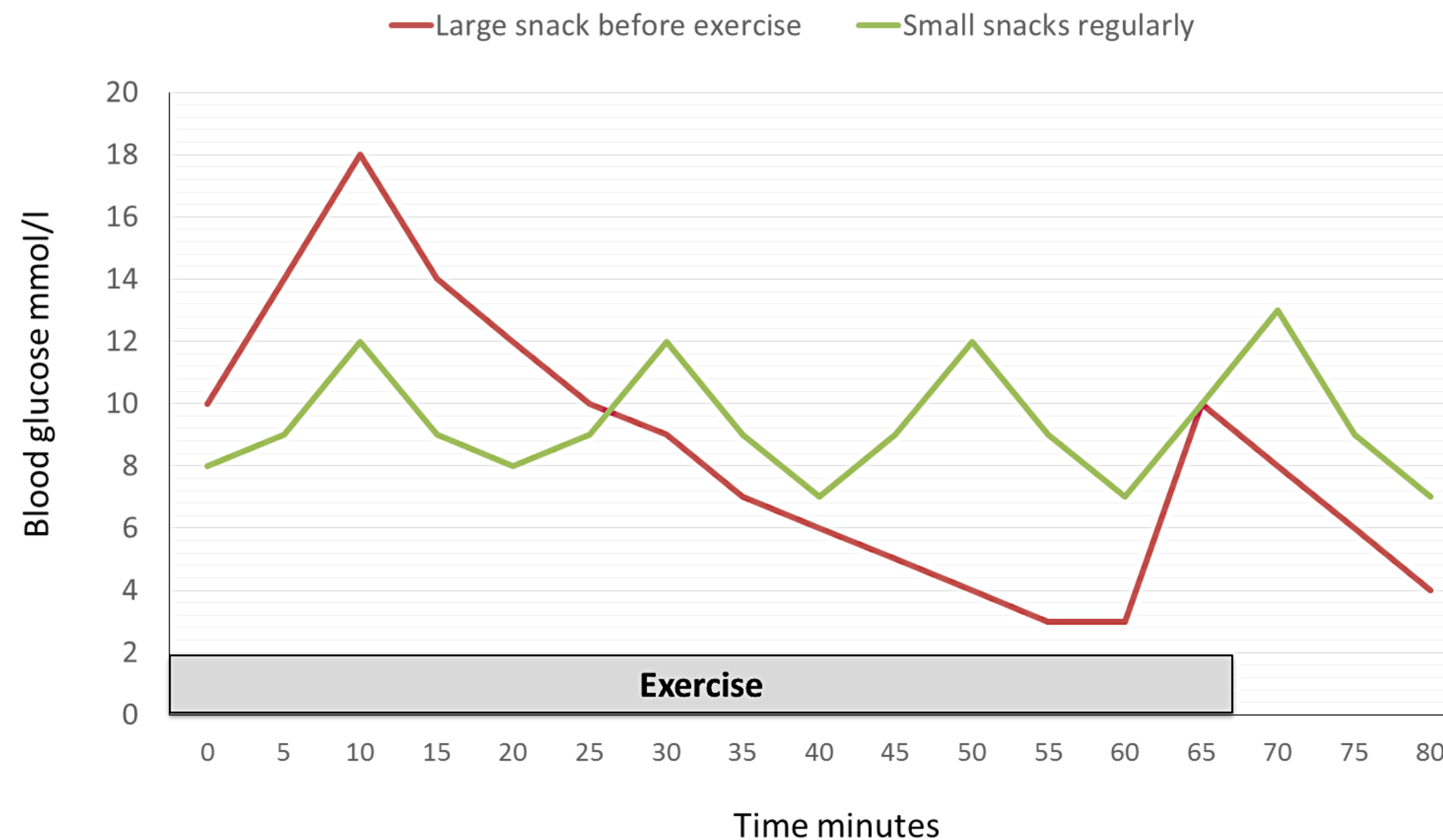


Using carbohydrate to manage glucose during exercise



Simple carbohydrate regime

Start with 60g/hour, move onto to 30g/hour or to other strategies



Taking something every 20 minutes will keep glucose stable

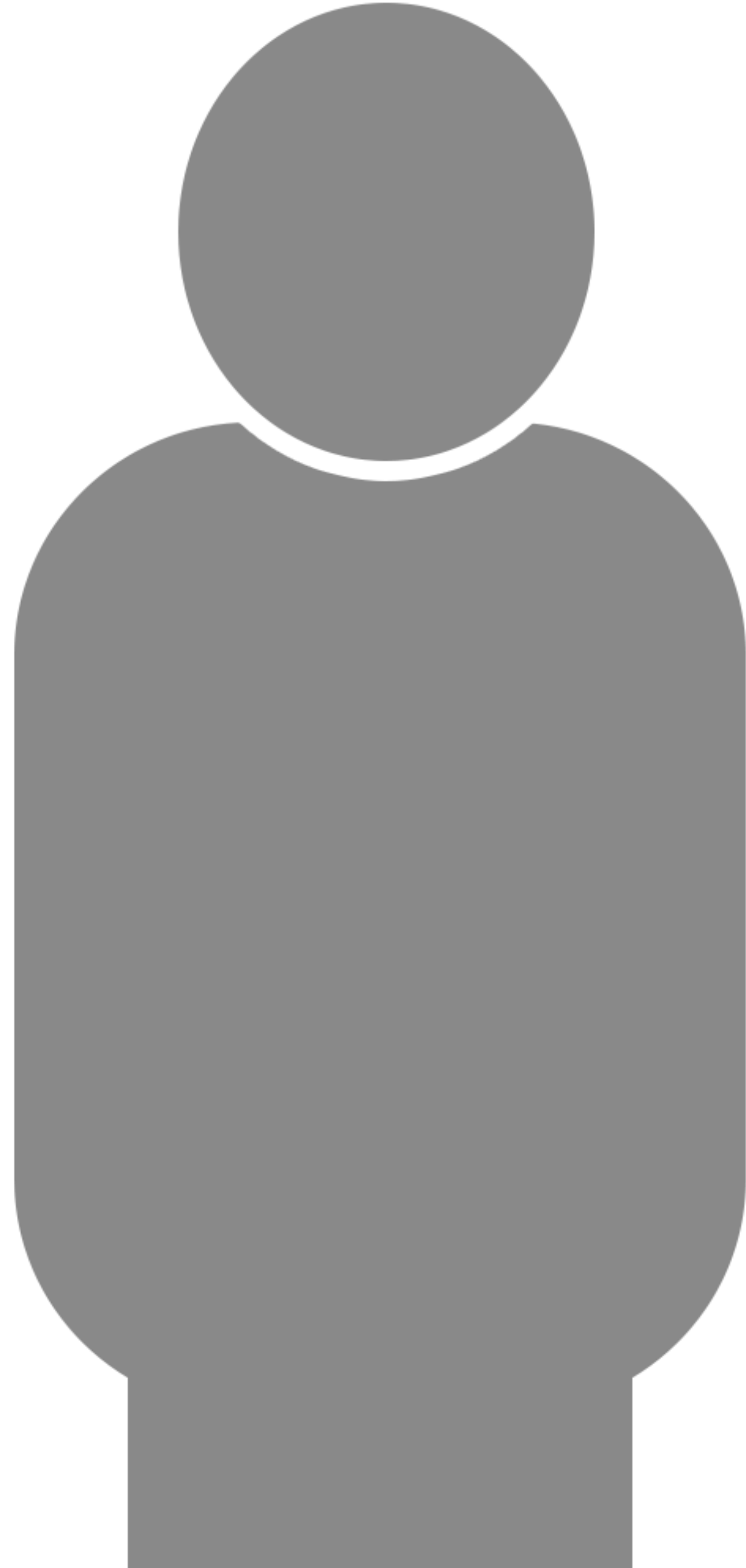
Use Libre traces to make adjustments going forward







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Carbohydrate intake during exercise



CGM Glucose level	Trend arrow(s)	Action	Comments
<5.0 mmol/L	None or downward trending	15-20g CHO	Stop exercise if glucose \leq 3.9 mmol/L
5.0-6.1 mmol/L	 Libre	15g CHO	
5.0-6.1 mmol/L	 Libre	20g CHO	
6.1-6.9 mmol/L	 or  Libre	8g CHO	
>7.0 mmol/L		No action	



Using exercise to manage glucose during exercise

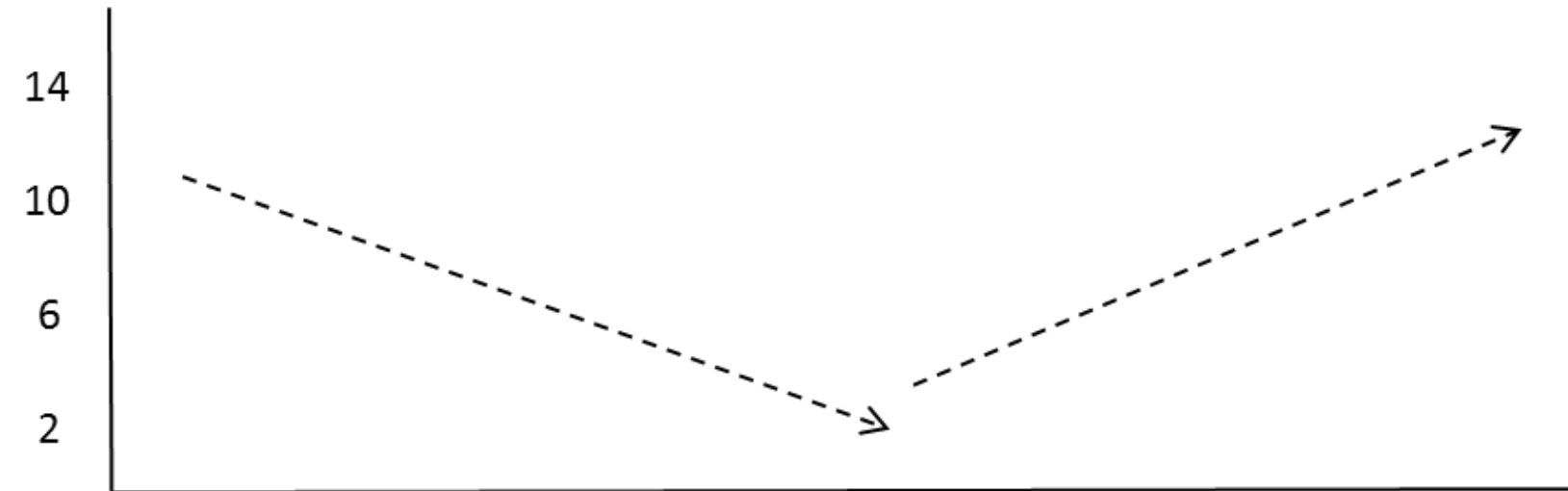
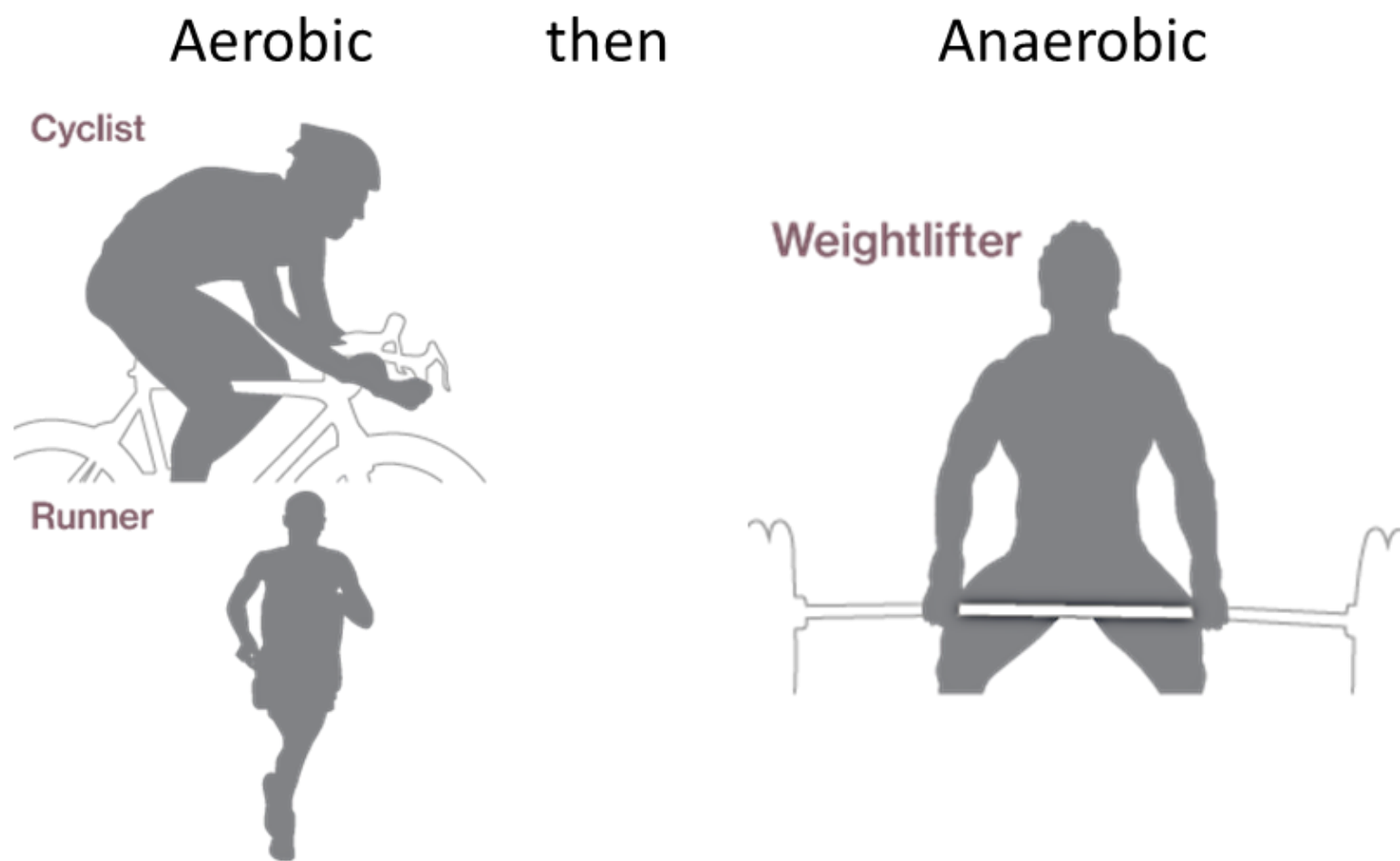


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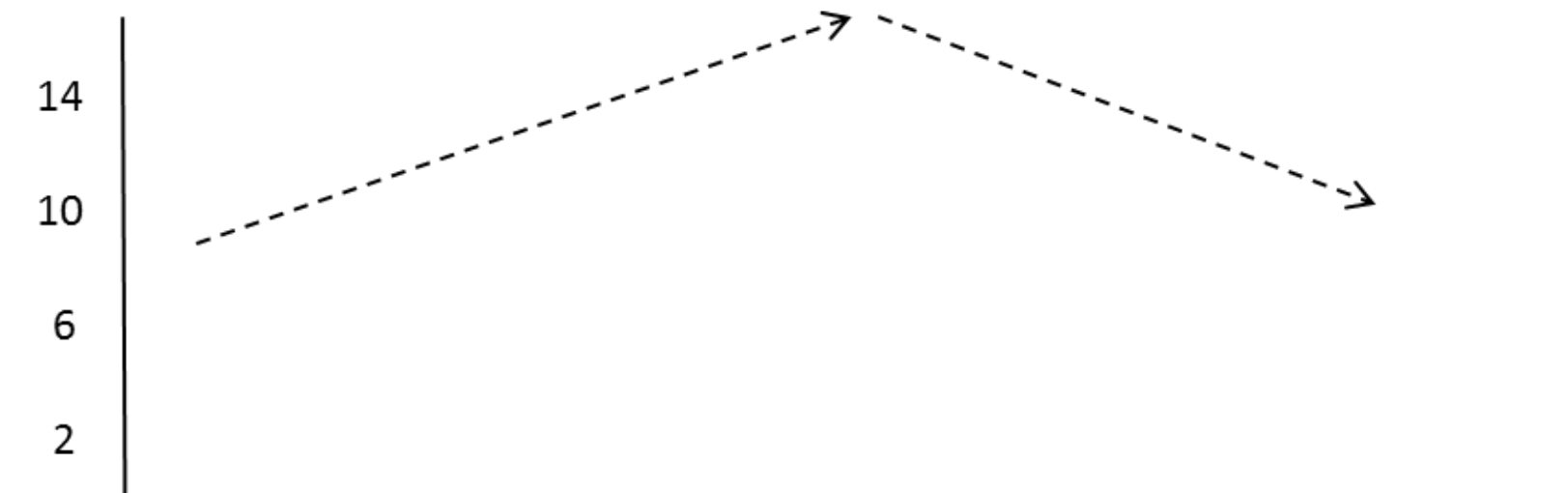
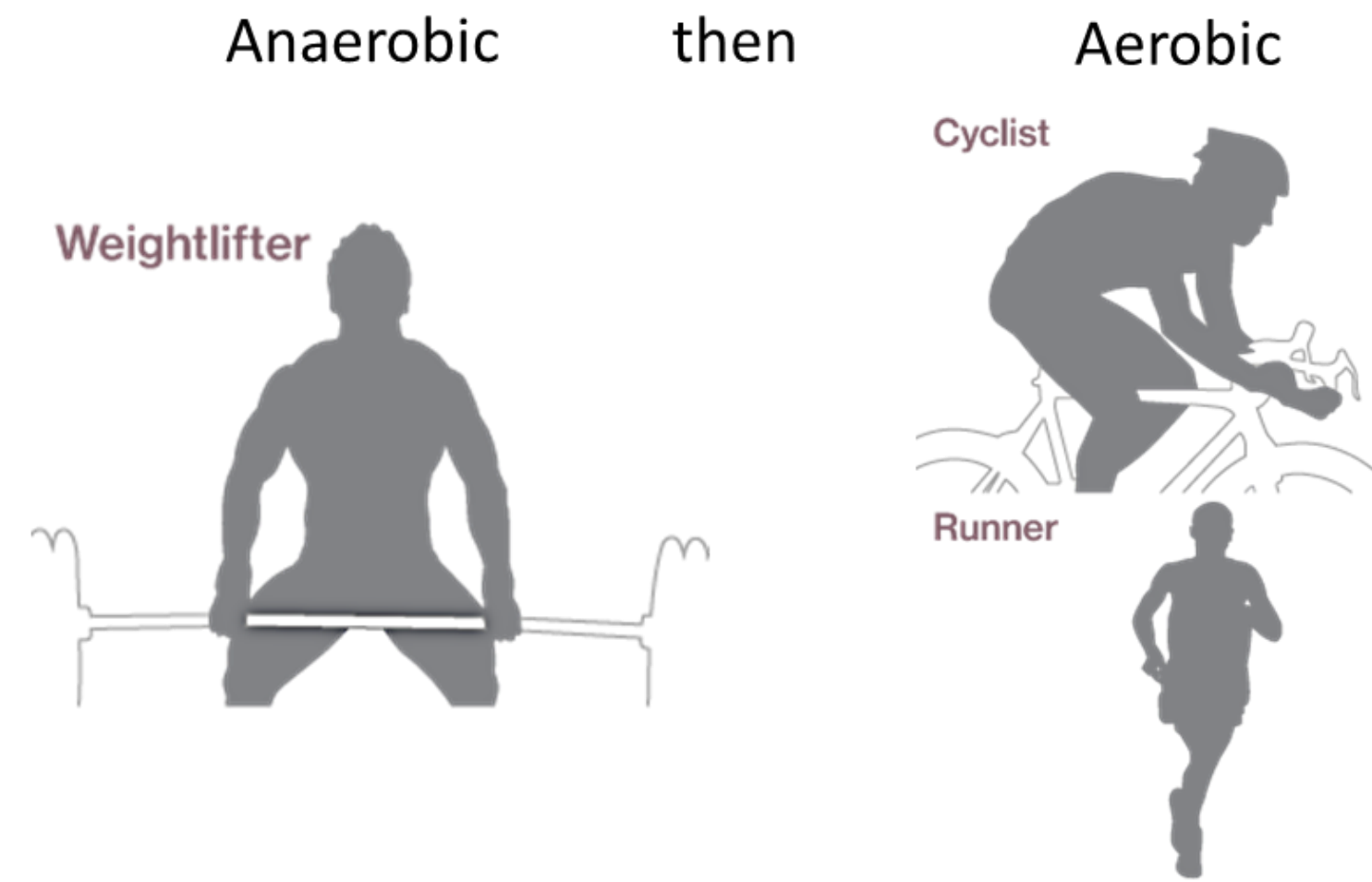


Order of exercise types

Order 1



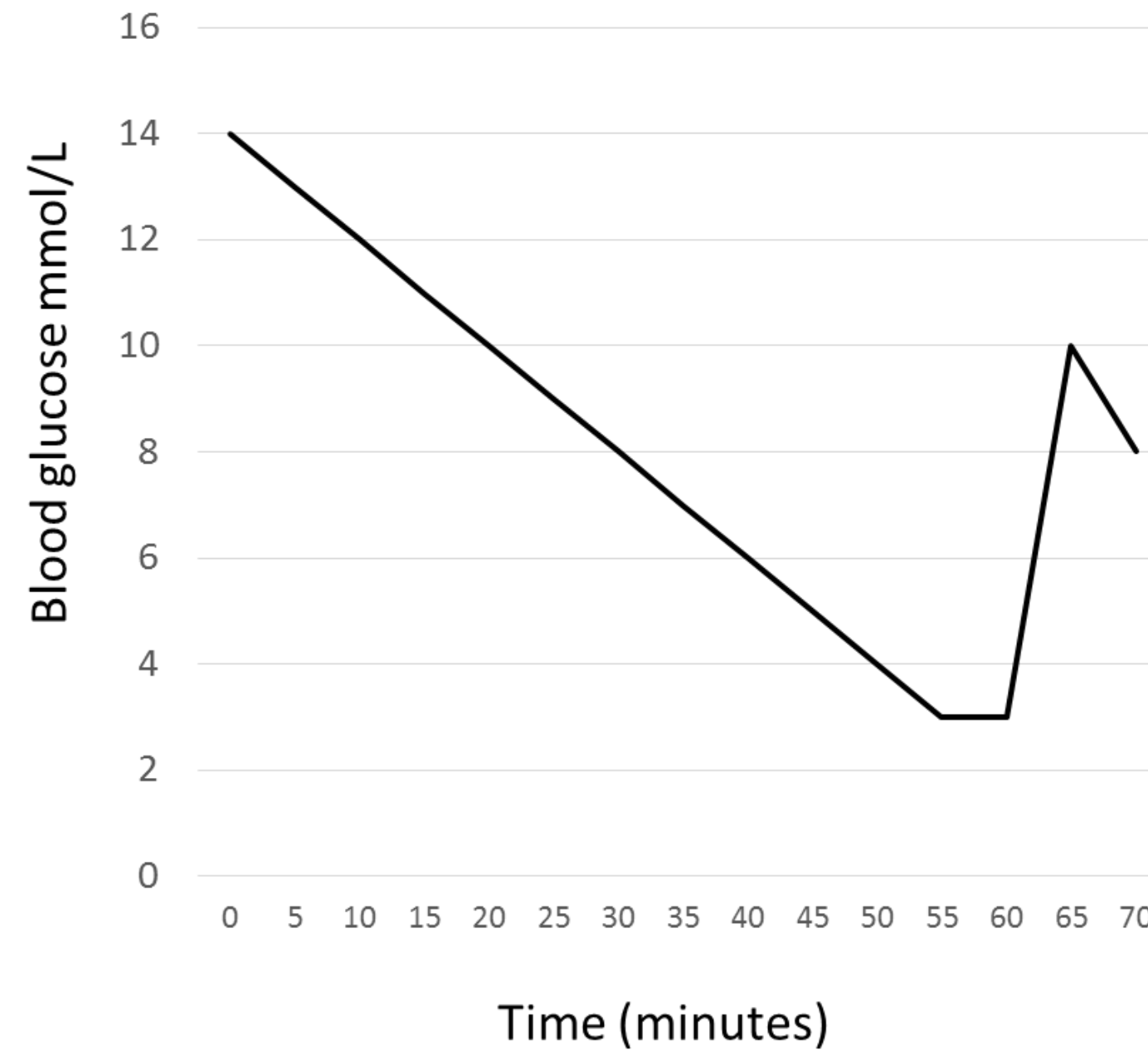
Order 2



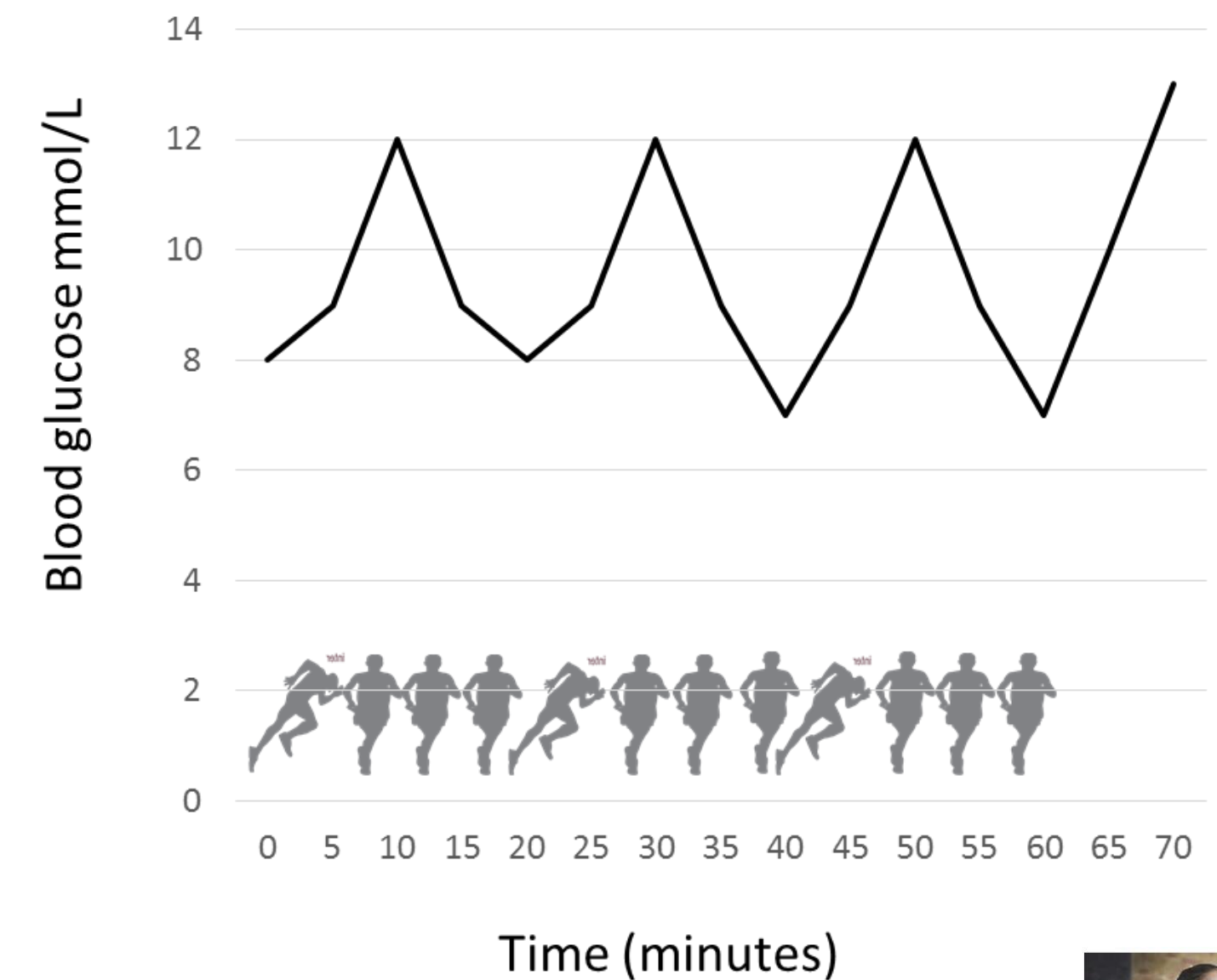
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Sprinting increases your glucose

Continuous exercise

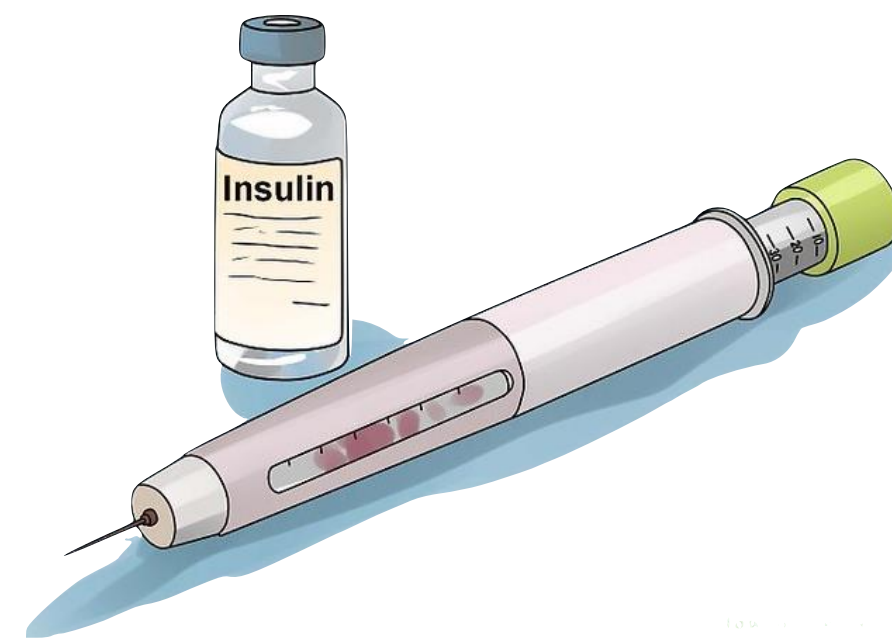


Continuous exercise + sprints



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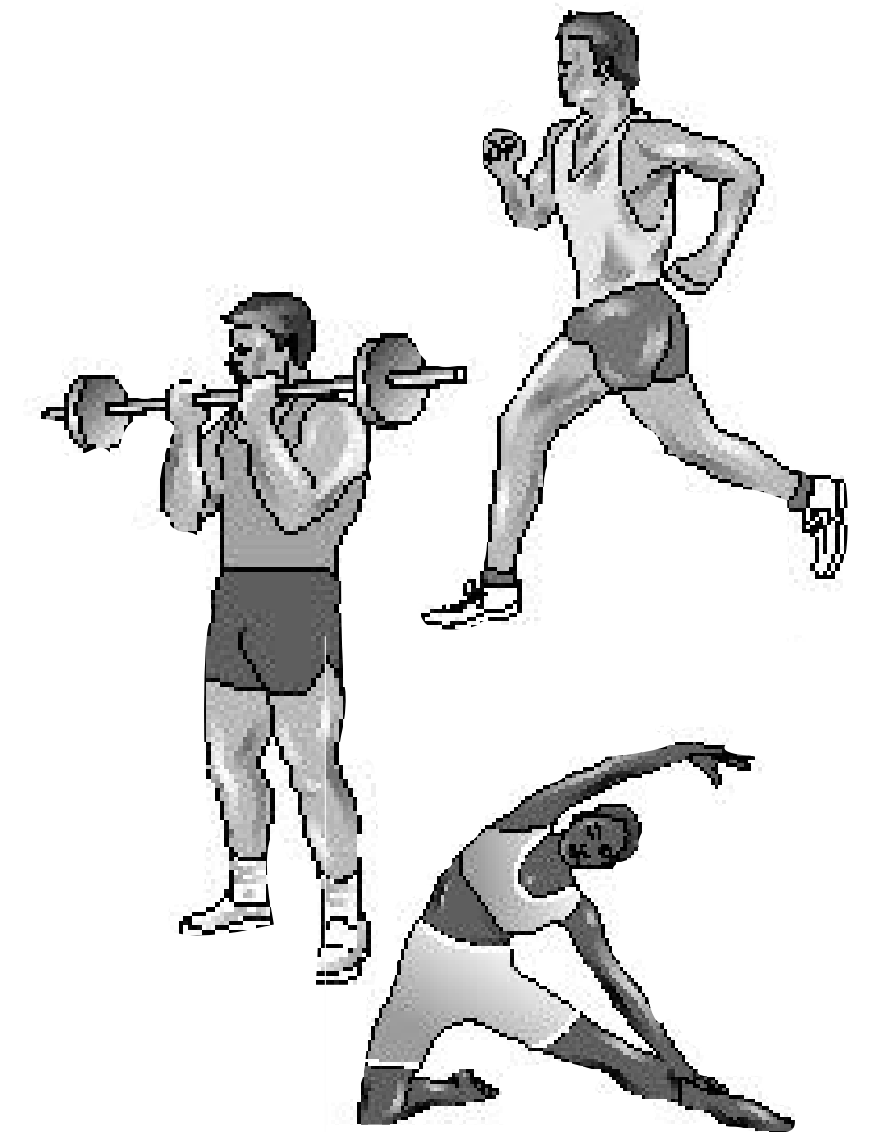
Three ways to manage glucose after exercise



Insulin



Carbohydrate



Exercise

Using insulin to manage glucose post exercise

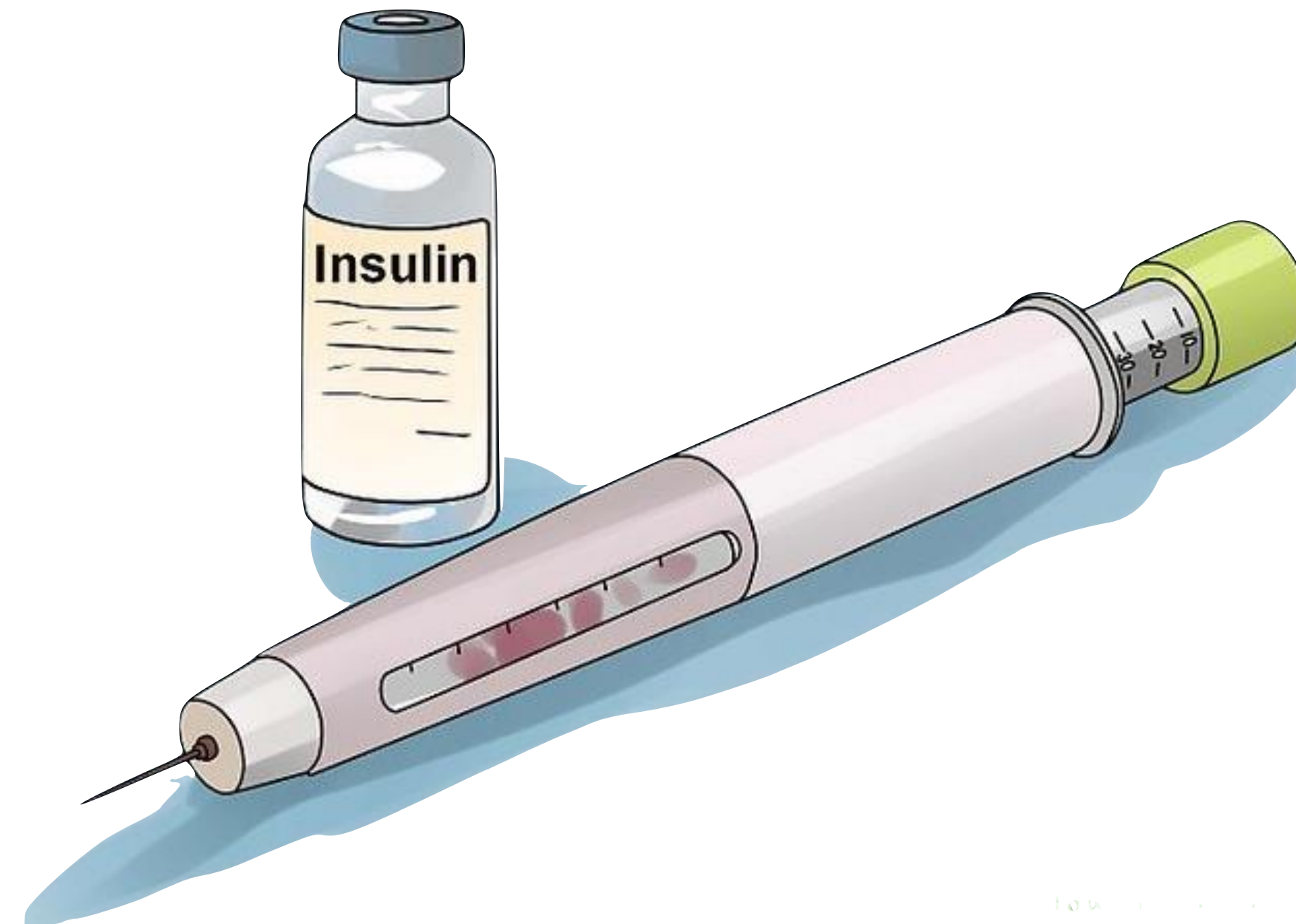


Image courtesy of iStockphoto.com

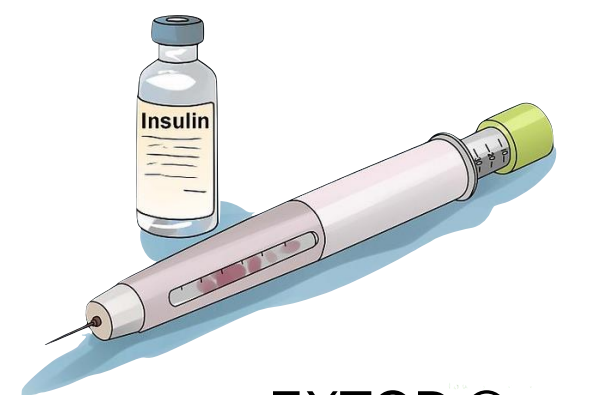
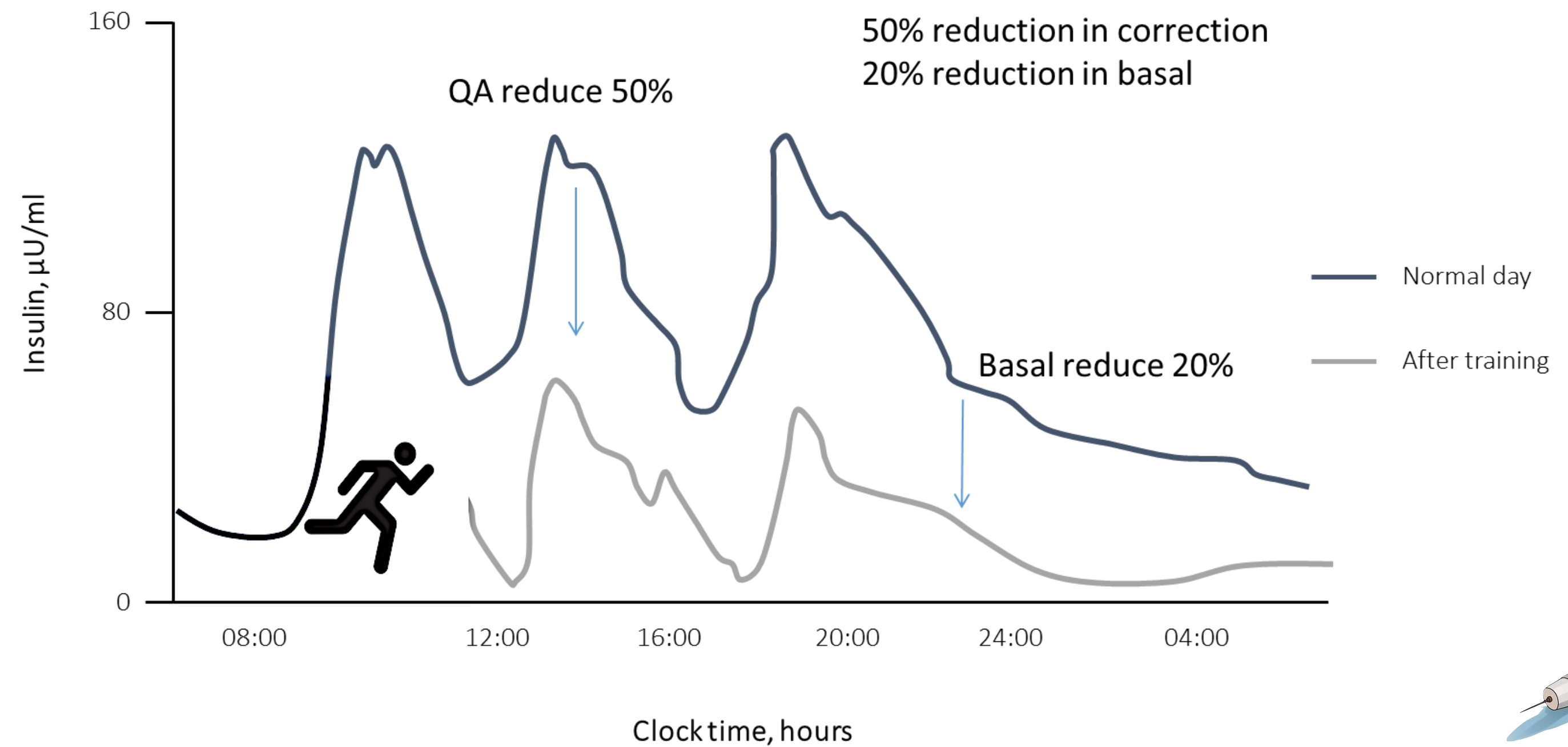


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Effect of exercise on Insulin sensitivity

50, 50, 20 rule
50% normal insulin with meals for 2 meals
50% reduction in correction
20% reduction in basal

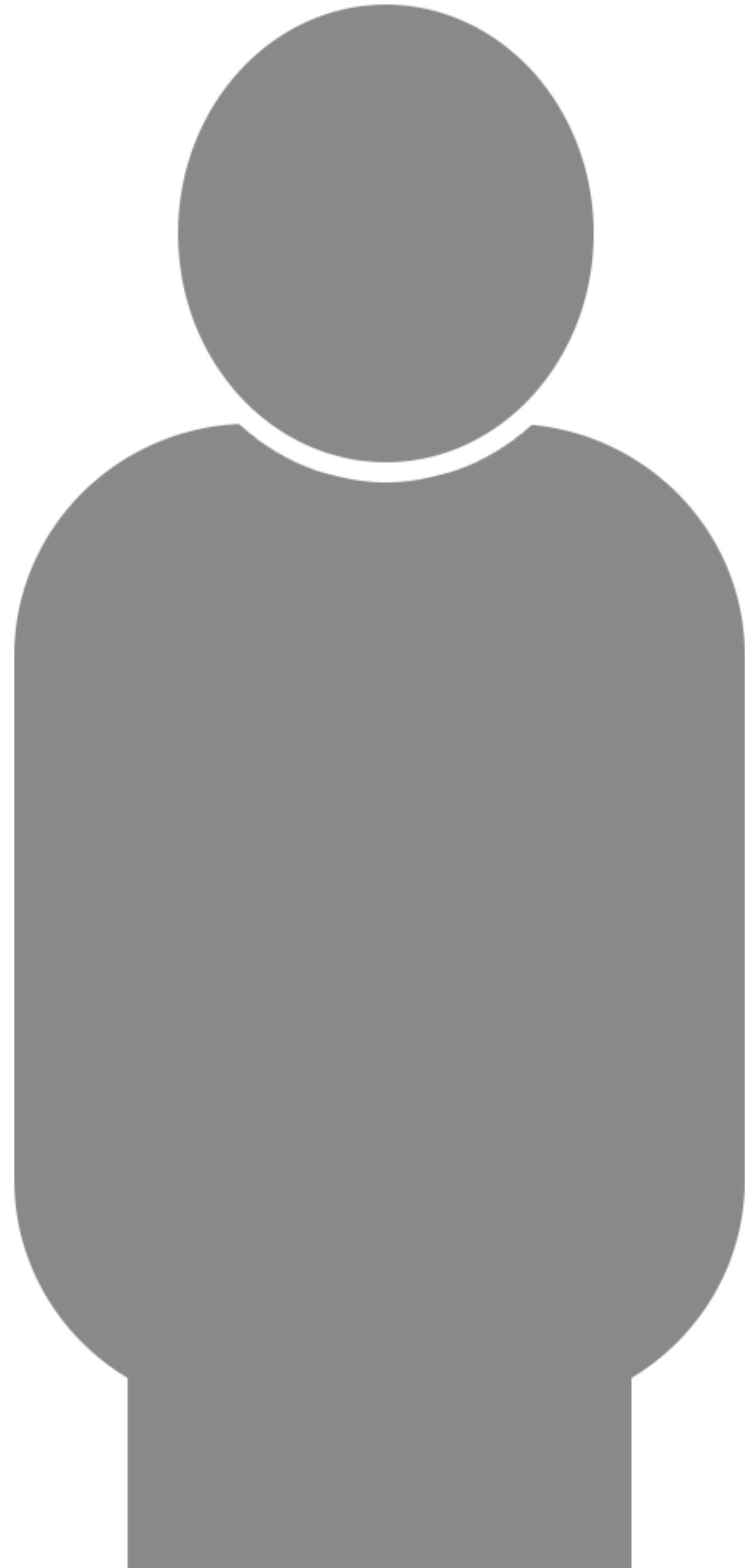


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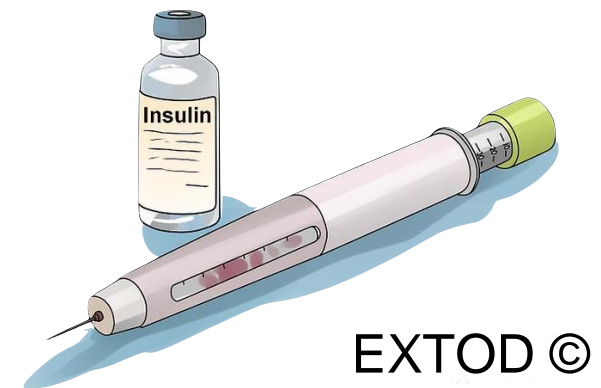




The 50-50-20 rule

- 50% reduction of normal bolus for next 2 meals
- 50% reduction of normal correction for the next 12 hours
- 20% reduction of normal evening background if:
 - after 4pm
 - over 2 hours of exercise
 - HIT at any time of the day
 - Insulin pens - only applies to glargine / detemir / intermediate acting insulin
 - Insulin pump - 20% reduction background for 6 hours from when gone to bed

Use libre traces to make adjustments going forward



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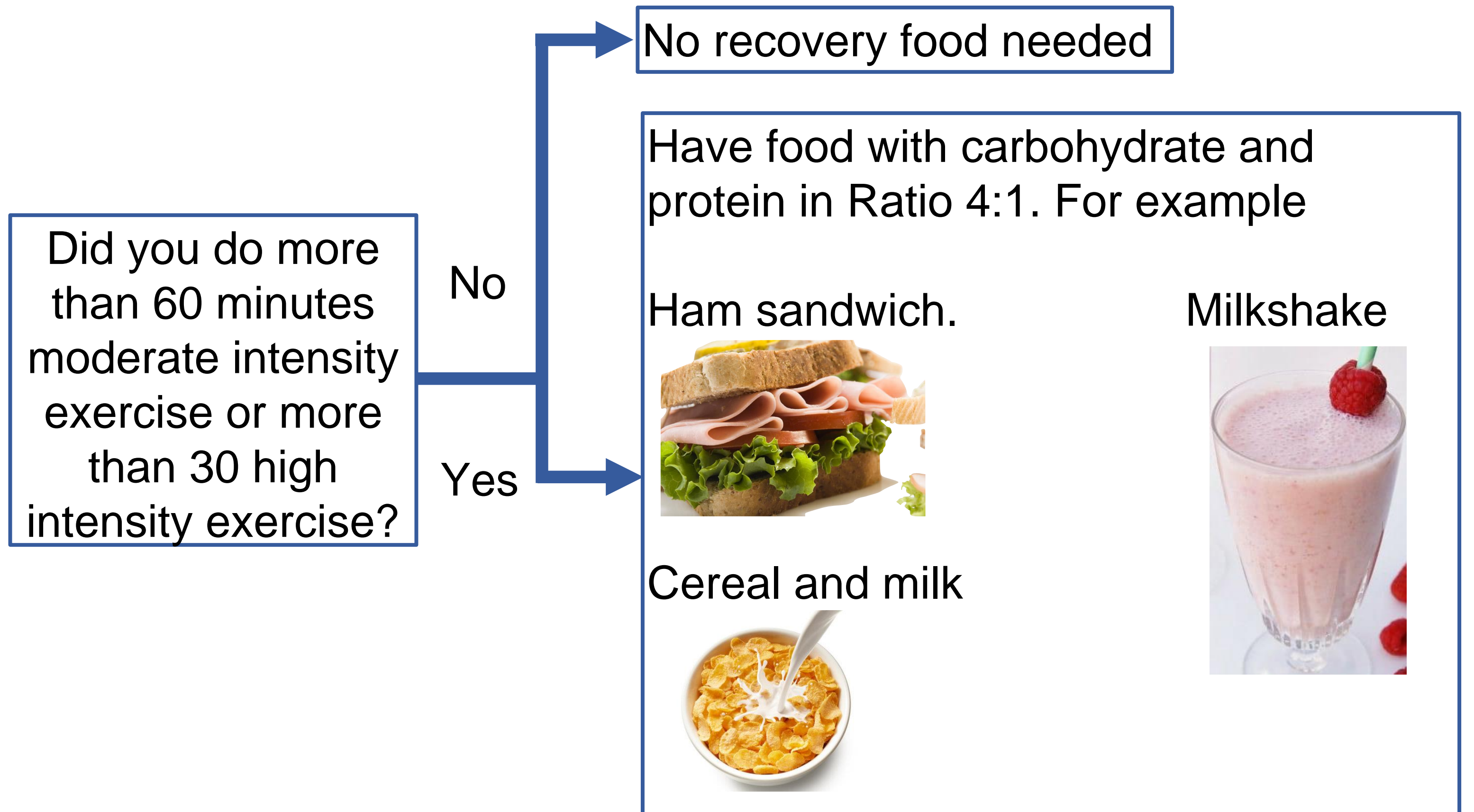
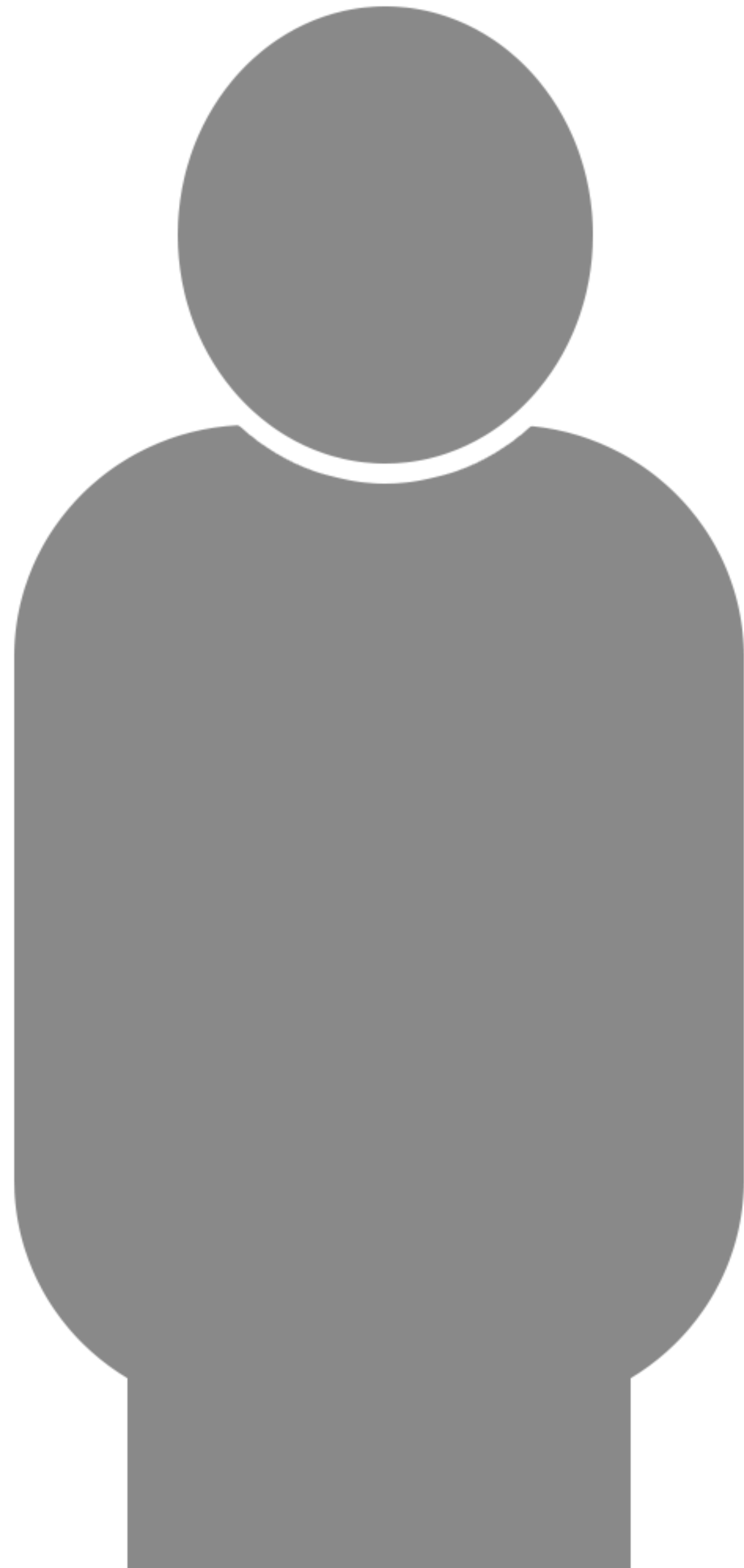
Using carbohydrate to manage glucose post exercise

Three things to think about

- Is your daily carbohydrate correct?
- Are you taking a recovery meal after exercise?
- Do you need to have something before bed?



Recovery food



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Diet Strategies for nocturnal hypoglycemia

Consider bedtime snack with protein and complex carbohydrate if:

- exercised after 4 pm
- exercised more than 2 hours



Using exercise to manage glucose post exercise

Exercise can help manage glucose post exercise in two ways

- Help to lower high glucose
- The more you do the easier the control



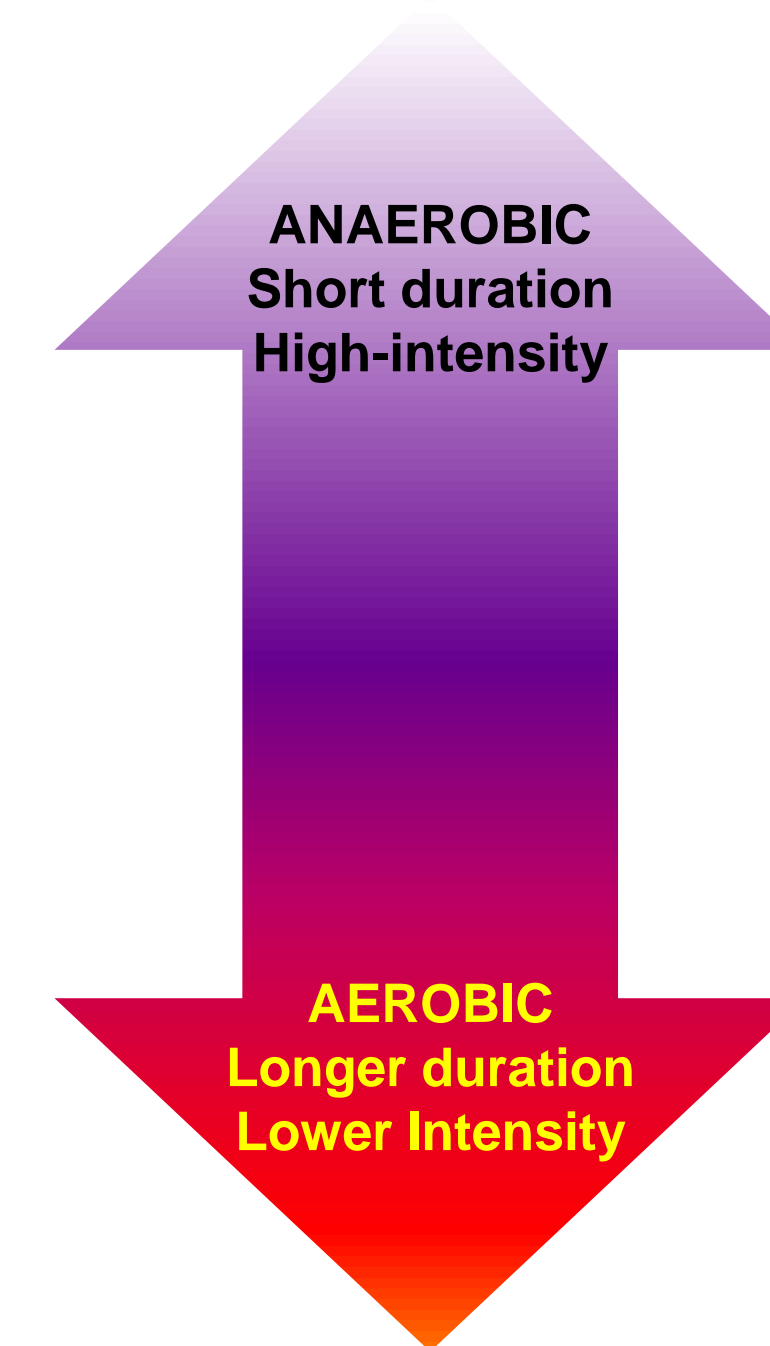
Using exercise to lower glucose post exercise

Weightlifting, Tag
Sprinting, Diving, Swimming, Gymnastics,
Wrestling, Dodge ball, Volleyball, Ice hockey, Track cycling

Basketball, Football, Tennis, Lacrosse
Skating
Skiing (slalom & downhill), Field hockey
Rowing (middle distance)
Running (middle distance)

In-line skating
Cross country skiing
Brisk Walking
Jogging
Cycling } **Warm down**

Hyperglycaemia



Hypoglycaemia



Learning objectives

1. What you need to think about before you exercise
 - What exercise, what time, previous and prevailing glucose
2. What options are available for managing glucose during exercise
 - Insulin (basal/bolus/pens/pumps), CHO (simple and ExCarbs), exercise
3. What options are available for managing glucose after exercise
 - Insulin (50:50:20 rule), CHO (recovery and daily requirements), exercise
4. How the libre can help to manage glucose levels before, during and after exercise
 - Prevailing glucose and trend (before, during after), fine tuning algorithms



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