

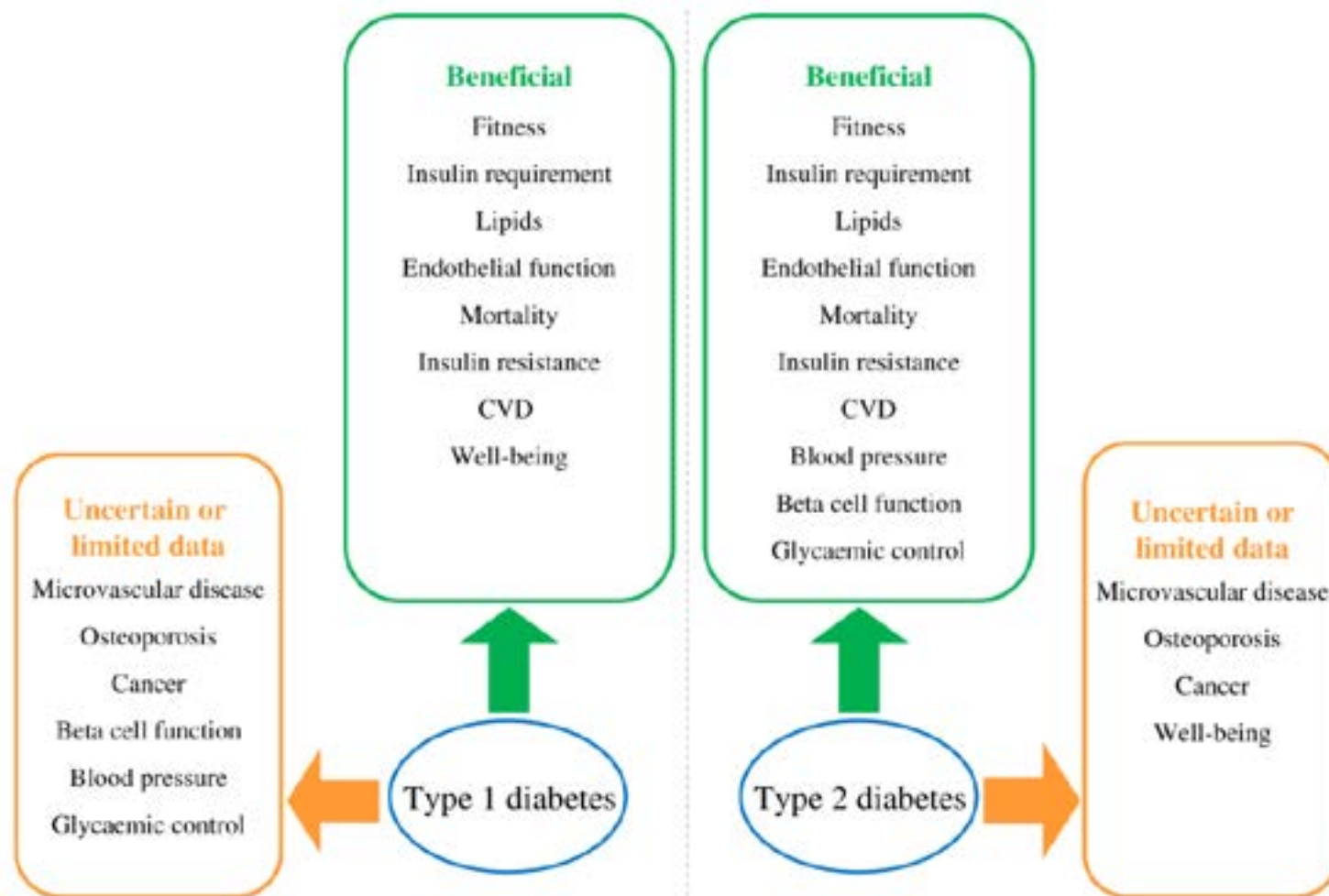
Sport, bewegen en diabetes, met de nieuwste technologie

Prof. Dr. Pieter Gillard

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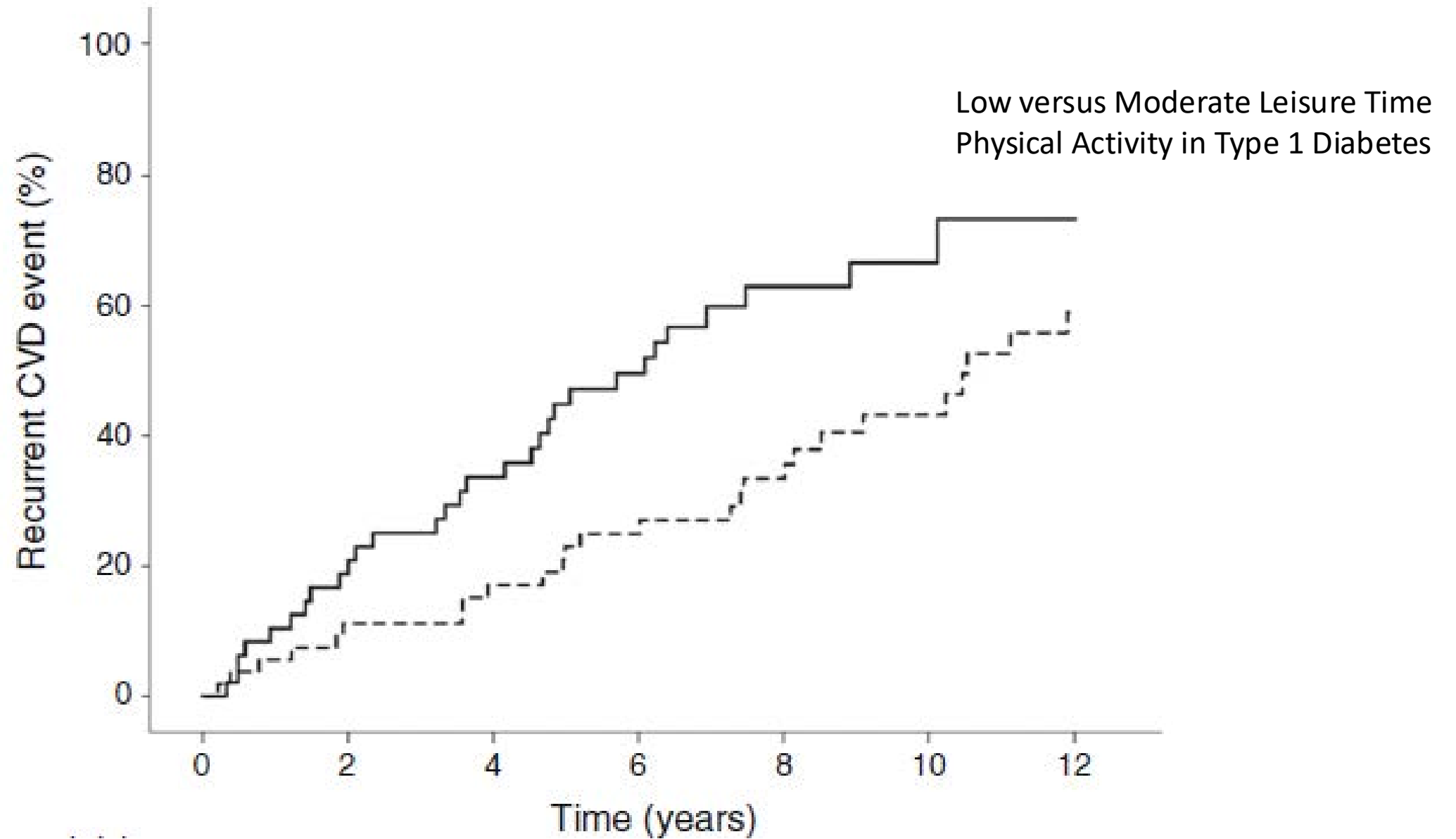


Voordelen actief zijn met diabetes



Wake AD. World J Diabetes. 2022 Mar 15;13(3):161-184

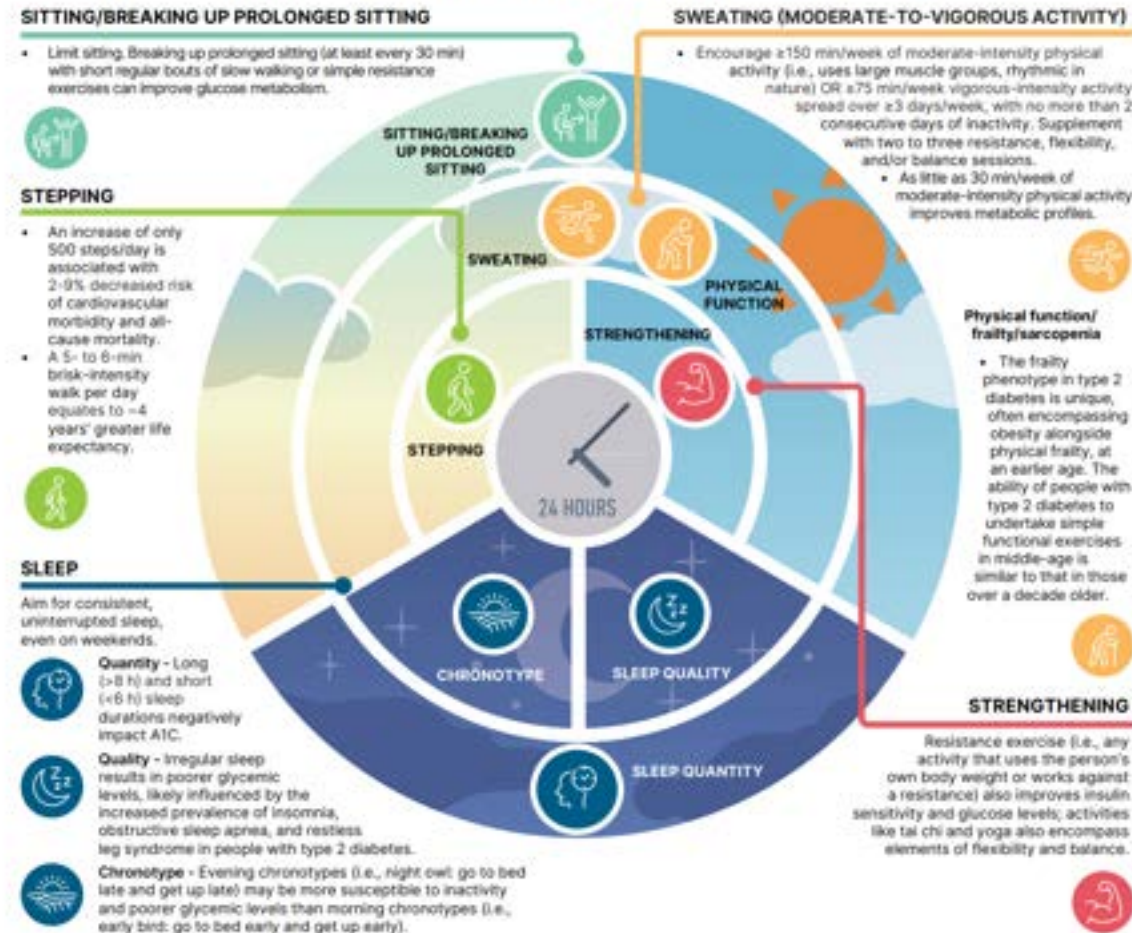
Chimen M et al. Diabetologia 2012;3:542-51.



Recommendations Physical Activity

- Children and Adolescents T1D en T2D:
 - At least **60 min/day** of moderate or vigorous-intensity **aerobic activity**
 - At least **3 days/week** of vigorous **muscle**-strengthening and **bone**-strengthening
 - **Limit sedentary** time, including recreational screen time
- Adults T1D and T2D:
 - **> 150 min/week** of moderate or vigorous-intensity **aerobic activity**, at least **3 days/week**, no more 2 days inactivity in a row
 - **75 min** of vigorous-intensity or interval might be sufficient in physically fit individuals
 - **2-3 sessions/week of resistance** exercise
 - Decrease amount of daily **sedentary behaviour** (max 30 min consecutively)
 - Promote walking, yoga, housework, gardening, swimming, dancing
 - **Flexibility and balance** training 2-3x/week

Importance of 24-hour physical behaviors for type 2 diabetes

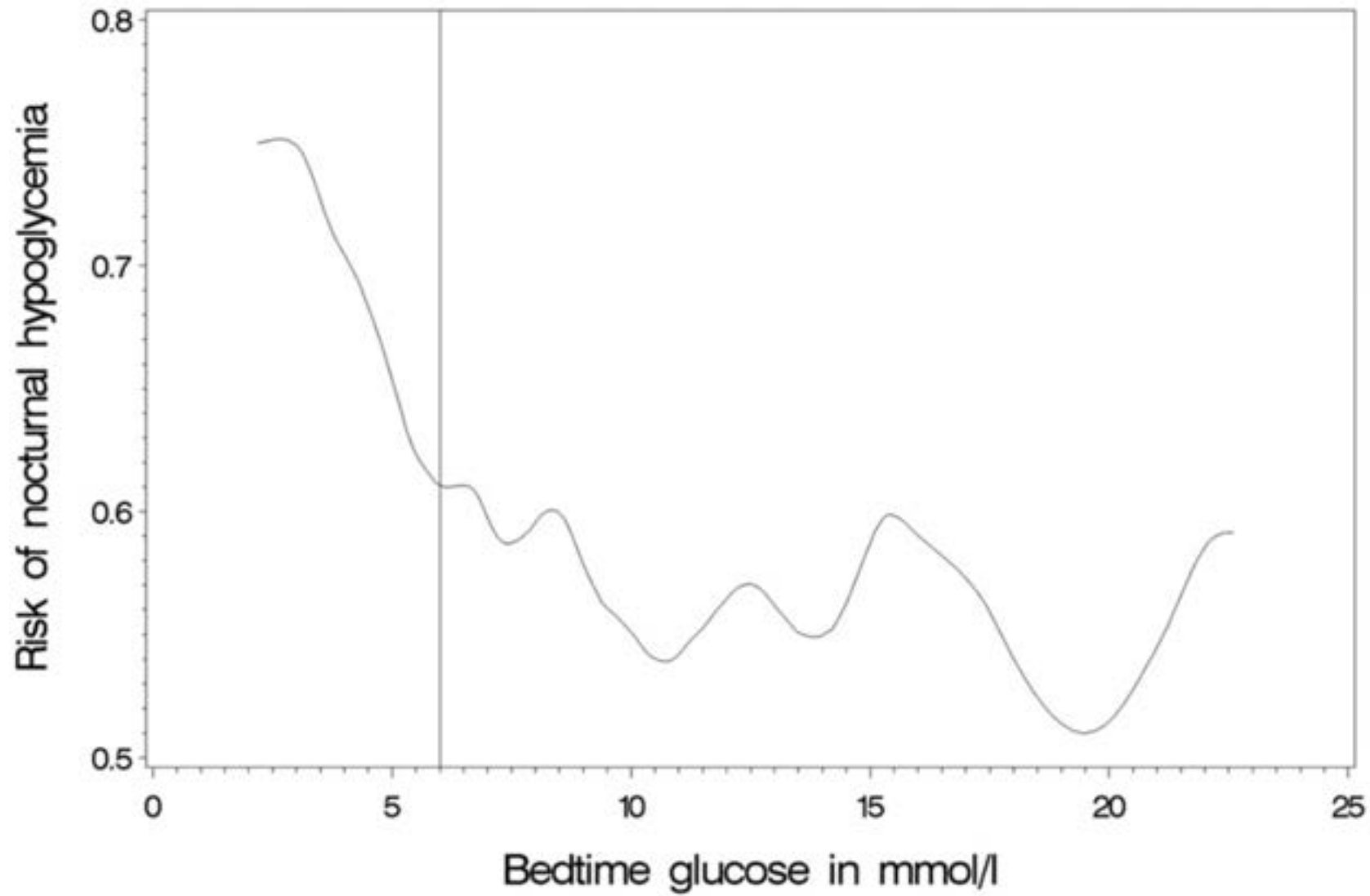


	Glucose/ insulin	Blood pressure	A1C	Lipids	Physical function	Depression	Quality of life
SITTING/BREAKING UP PROLONGED SITTING	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️
STEPPING	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️
SWEATING (MODERATE-TO-VIGOROUS ACTIVITY)	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️
STRENGTHENING	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️
ADEQUATE SLEEP DURATION	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️
GOOD SLEEP QUALITY	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️
CHRONOTYPE/CONSISTENT TIMING	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️	⬆️

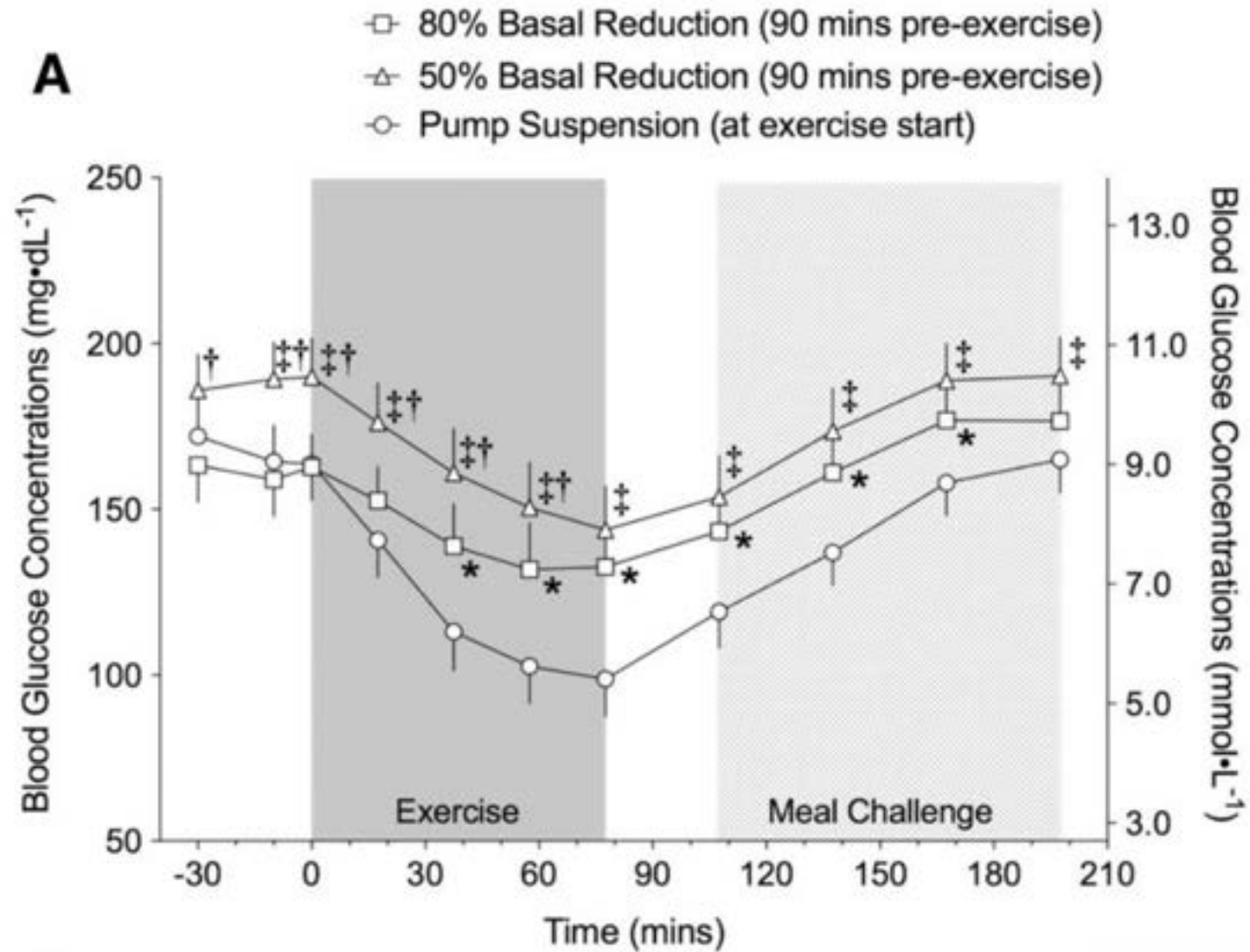
IMPACT OF PHYSICAL BEHAVIORS ON CARDIOMETABOLIC HEALTH IN PEOPLE WITH TYPE 2 DIABETES

⬆️ Higher levels of improvement (physical function, quality of life) ⬆️ Lower levels of improvement (glucose/insulin, blood pressure, A1C, lipids, depression)
 ⬆️ No data available
 ⬆️ Green arrows = strong evidence ⬆️ Yellow arrows = medium-strength evidence ⬆️ Red arrows = limited evidence

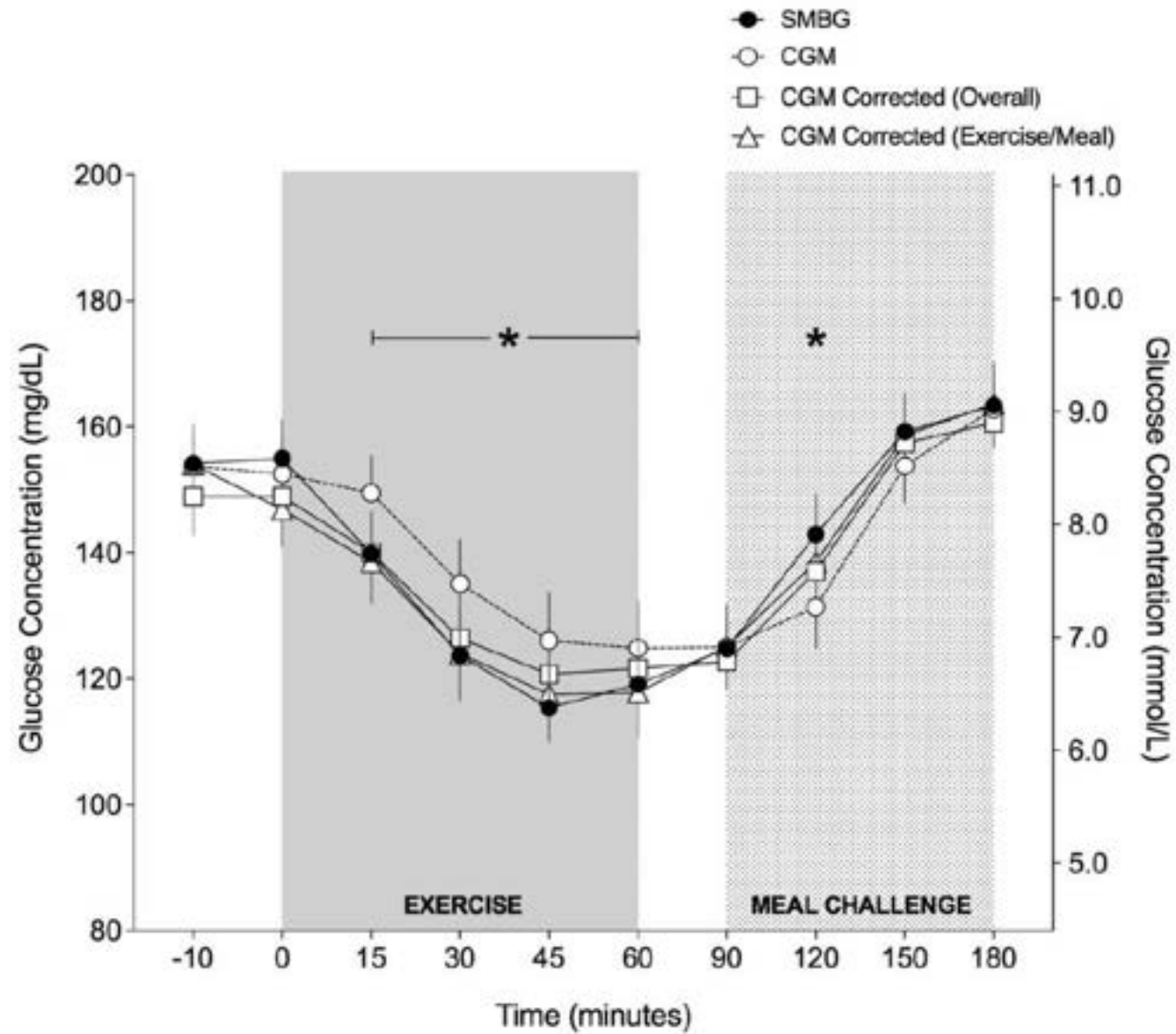
Uitdagingen: nachtelijke hypo's



Uitdagingen: hypo's tijdens sporten



Uitdagingen: sensor loopt achter



Uitdagingen: zoveel factoren die glycemie beïnvloeden

Glucose responses to exercise = highly variable

Exercise type

Age

Sex

Recent glucose trends

Time of day

Nutrition

Activity habits

HbA1c

Duration of T1D

Insulin on board (IOB)

Heart rate

...

DUS



“fysiek actief zijn is gezond”

maar...

maak het veilig en haalbaar

Steps to Success

A hand is visible on the left side, gripping a horizontal rung of a silver metal ladder. The ladder extends from the bottom left towards the top center of the frame, creating a strong sense of perspective. The background is a solid, deep blue color. The title 'Steps to Success' is written in a white, thin-lined serif font across the upper portion of the image.

Get to know yourself



The use of automated insulin delivery around physical activity and exercise in type 1 diabetes: a position statement of the European Association for the Study of Diabetes (EASD) and the International Society for Pediatric and Adolescent Diabetes (ISPAD)

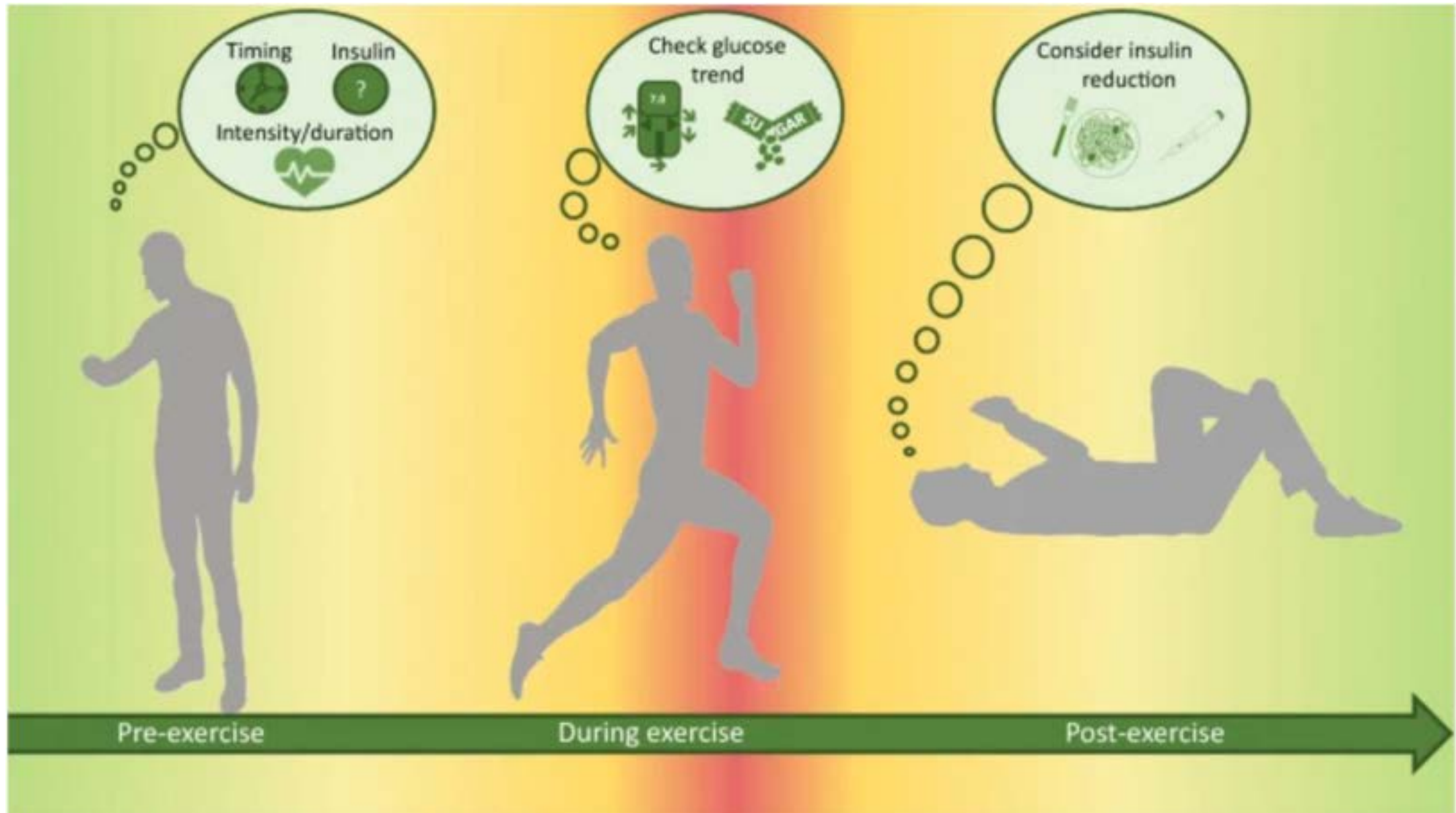
Othmar Moser^{1,2,3} · Dessi P. Zaharieva⁴ · Peter Adolfsson^{5,6} · Tadej Battelino^{7,8} · Richard M. Bracken⁹ · Bruce A. Buckingham⁴ · Thomas Danne^{10,11} · Elizabeth A. Davis^{12,13,14} · Klemen Dovč^{7,8} · Gregory P. Forlenza¹⁵ · Pieter Gillard¹⁶ · Sabine E. Hofer¹⁷ · Roman Hovorka^{18,19} · Peter G. Jacobs²⁰ · Julia K. Mader² · Chantal Mathieu¹⁶ · Kirsten Nørgaard^{21,22} · Nick S. Oliver²³ · David N. O'Neal^{24,25,26} · John Pemberton²⁷ · Rémi Rabasa-Lhoret^{28,29,30} · Jennifer L. Sherr³¹ · Harald Sourij^{2,3} · Martin Tauschmann³² · Jane E. Yardley^{28,33} · Michael C. Riddell³⁴

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Abstract

Regular physical activity and exercise (PA) are cornerstones of diabetes care for individuals with type 1 diabetes. In recent years, the availability of automated insulin delivery (AID) systems has improved the ability of people with type 1 diabetes to achieve the recommended glucose target ranges. PA provide additional health benefits but can cause glucose fluctuations, which challenges current AID systems. While an increasing number of clinical trials and reviews are being published on different AID systems and PA, it seems prudent at this time to collate this information and develop a position statement on the topic. This joint European Association for the Study of Diabetes (EASD)/International Society for Pediatric and Adolescent Diabetes (ISPAD) position statement reviews current evidence on AID systems and provides detailed clinical practice points for managing PA in children, adolescents and adults with type 1 diabetes using AID technology. It discusses each commercially available AID system individually and provides guidance on their use in PA. Additionally, it addresses different glucose responses to PA and provides stratified therapy options to maintain glucose levels within the target ranges for these age groups.

ENKELE KERNBEGRIPPEN



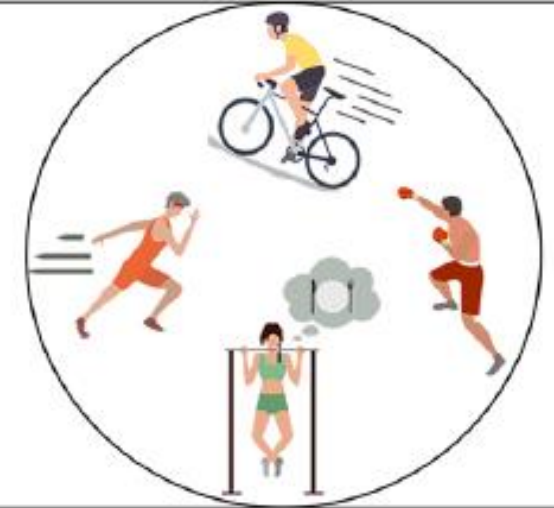
**Exercise intensity
and
mode**



**Postprandial,
continuous, sustained,
prolonged aerobic exercise;
low stress hormone response**



**Mixed activity;
individual and
team sports**

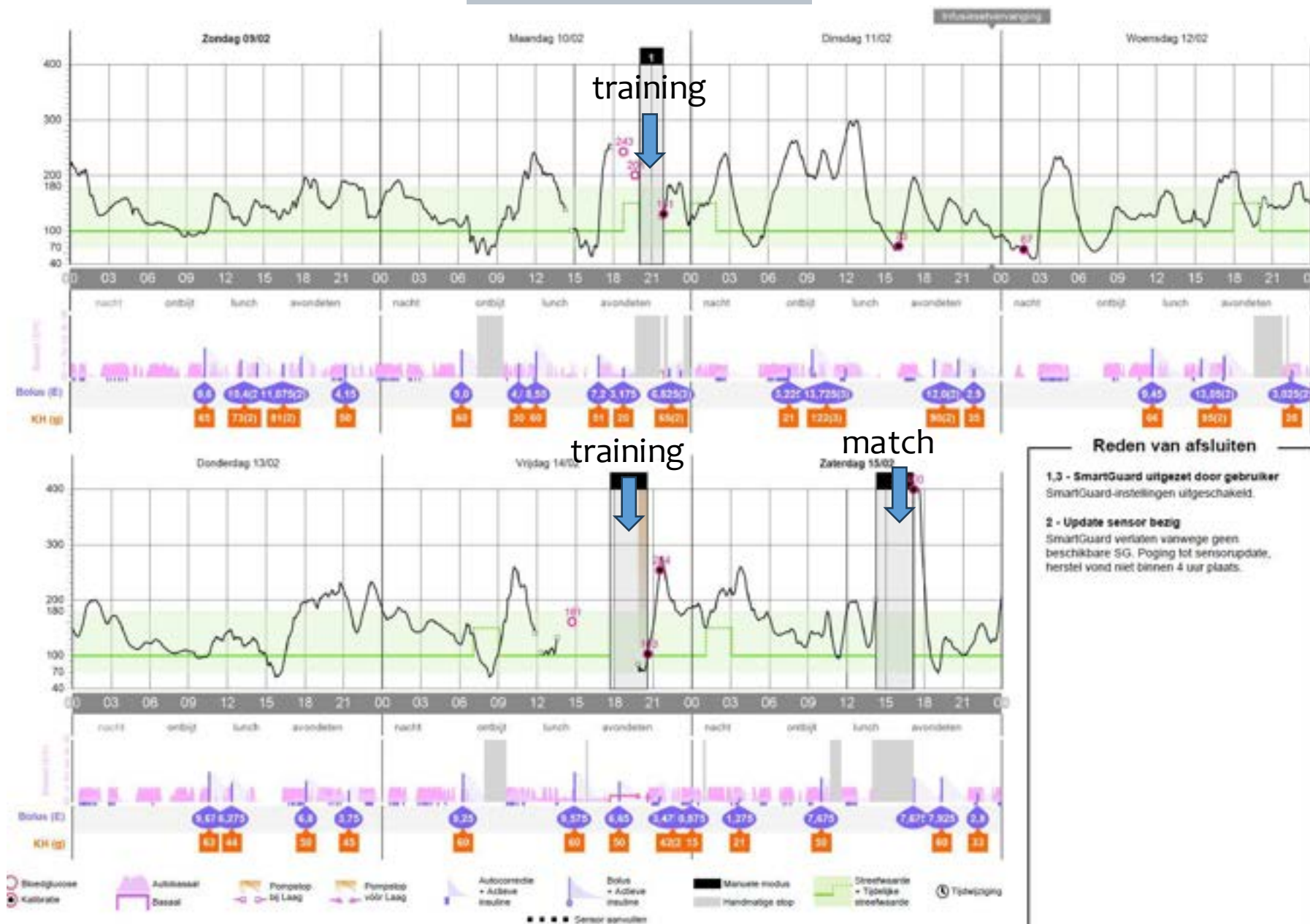


**Overnight fasted,
burst, explosive,
competitive anaerobic exercise;
high stress hormone response**

ENKELE KERNBEGIPPEN

Exercise intensity and mode					
	Postprandial, continuous, sustained, prolonged aerobic exercise; low stress hormone response	Mixed activity; individual and team sports	Overnight fasted, burst, explosive, competitive anaerobic exercise; high stress hormone response		
Average glucose response to exercise	↓	↘	→	↗	↑
Exogenous insulin requirements around exercise	↓	↘	→	↗	↑
Carbohydrate intake requirements around exercise	↑	↗	→	↘	↓

Case 1



Hoe sporten met AID aanpakken?

Consensus recommendations for PA and AID in type 1 diabetes

- 1 For planned PA, set a higher glucose target 1–2 h before activity if a decrease in glucose or stable glucose is expected during the activity [25, 26, 46, 51] (A) or maintain a regular or lower glucose target if a glucose increase is expected (D).
- 2 For planned PA within 2 h of a CHO-rich meal, reduce the prandial bolus insulin dose by 25–33% if a decrease in glucose is expected during the activity [25, 26] (A). Setting a higher glucose target should be initiated first before reducing the prandial bolus insulin dose [26, 31] (D).
- 3 Pay close attention to CGM readings and trend arrows and initiate small amounts of fast-acting CHO intake (3–20 g) if sensor glucose is <7.0 mmol/l during the activity [31] (D). The overconsumption of CHO may result in a rise in glucose and possibly an AID-predicted hyperglycaemic event, which would result in increased automated insulin delivery and possible subsequent increased risk for hypoglycaemia during or immediately after the activity.
- 4 For unplanned PA, set a higher glucose target immediately at the onset of activity if a decrease in glucose or stable glucose is expected and consume 10–20 g of fast-acting CHO if sensor glucose is <7.0 mmol/l [6, 7] (D), or maintain a regular or lower glucose target if a glucose increase is expected (D).
- 5 Where possible, plan for PA when insulin on board is low [63], such as before meals or in the fasted state [41] (B). Further, low-intensity PA is also recommended when glucose levels are elevated after meals, as these activities tend to bring elevated glucose concentrations to within a target range [64, 65] (C). However, PA should be avoided if glucose is >15.0 mmol/l and blood ketones are >1.5 mmol/l [4] (D).

1. Geplande activiteit: zet **hoger streefdoel 1-2 uur** voordien (als daling verwacht wordt)

Case 2

Marc

65 year

HbA1c 6,5%

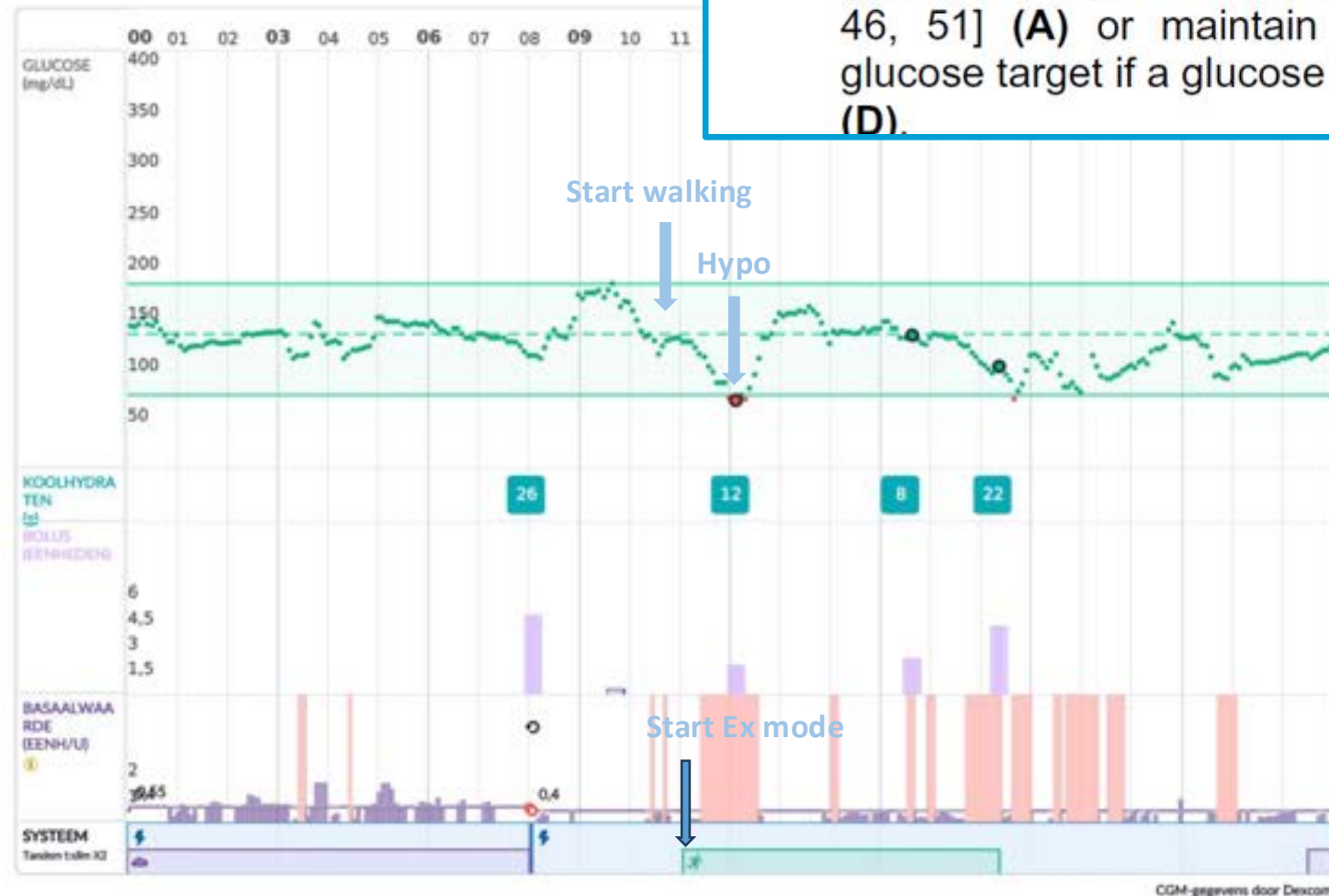
TIR 78%

Hobby: Walking

Problem:
Hypo during walking

Advise:
Use Ex mode
1-2 hours before PA

- 1 For planned PA, set a higher glucose target 1–2 h before activity if a decrease in glucose or stable glucose is expected during the activity [25, 26, 46, 51] **(A)** or maintain a regular or lower glucose target if a glucose increase is expected **(D)**.

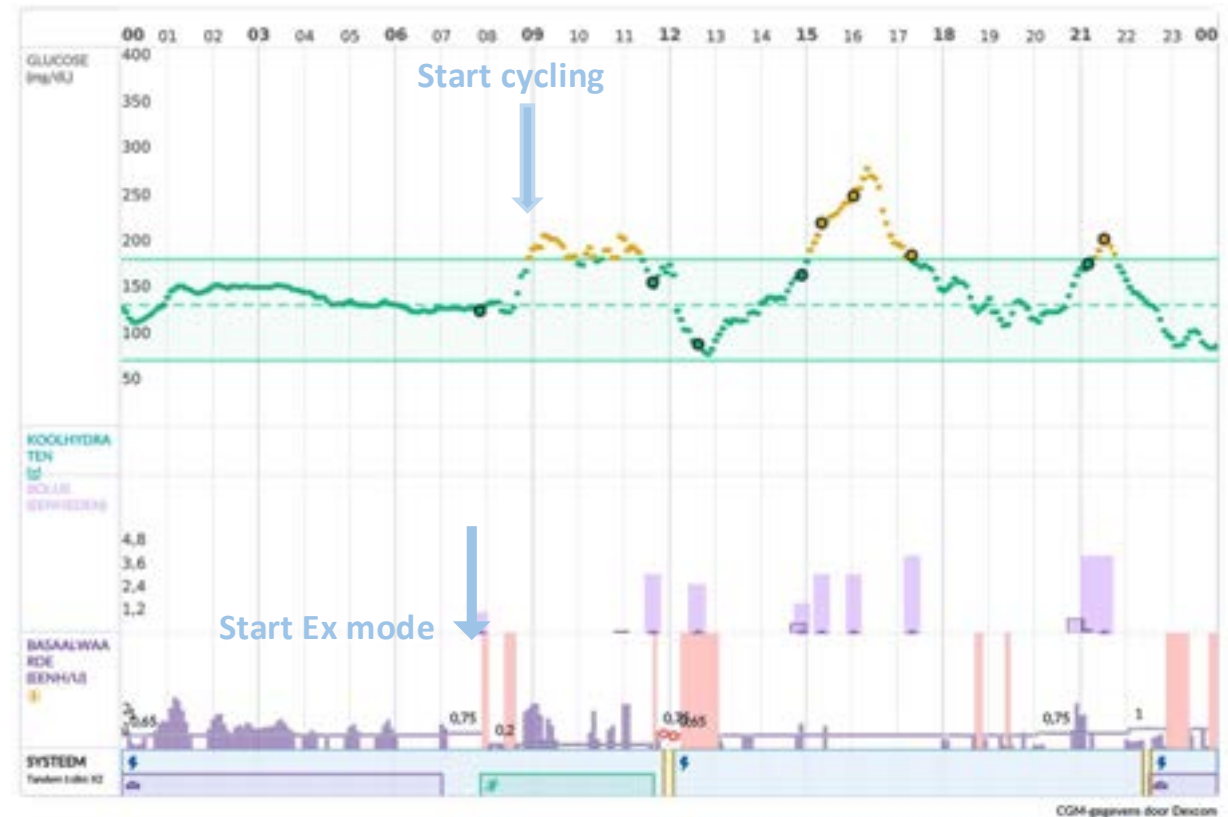


Case 2

Advise to avoid hypo

Use Ex mode 1-2 hours before PA

Control IQ (Tandem): Use Personal Profile with low basal and high ISF 1-2 hours before PA (>> less IOB)



Werk	Actief	
00:00	(4 uur)	0,85 Eenheden/u
04:00	(3 uur)	0,85 Eenheden/u
07:00	(3 uur)	1,3 Eenheden/u
10:00	(2 uur)	1,3 Eenheden/u
12:00	(5 uur)	1,3 Eenheden/u
17:00	(3 uur)	1,3 Eenheden/u
20:00	(2 uur)	1,2 Eenheden/u
22:00	(2 uur)	1,2 Eenheden/u

Personal Profile

08:00	(2 uur)	0,2 Eenheden/u	550 mg/dl
10:00	(2,5 uur)	0,2 Eenheden/u	550 mg/dl
12:30	(11,5 uur)	0,2 Eenheden/u	550 mg/dl

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1. Geplande activiteit: zet **hoger streefdoel 1-2 uur** voordien (als daling verwacht wordt)

2. Geplande activiteit binnen de 2 uur na KH-rijke maaltijd: **- 25-33% bolus** (als daling verwacht wordt). Hoger streefdoel ervoor opzetten!

case 3

Physical Activity: Running after breakfast

Problem: hypo's during PA

2

For planned PA within 2 h of a CHO-rich meal, reduce the prandial bolus insulin dose by 25–33% if a decrease in glucose is expected during the activity [25, 26] **(A)**. Setting a higher glucose target should be initiated first before reducing the prandial bolus insulin dose [26, 31] **(D)**.



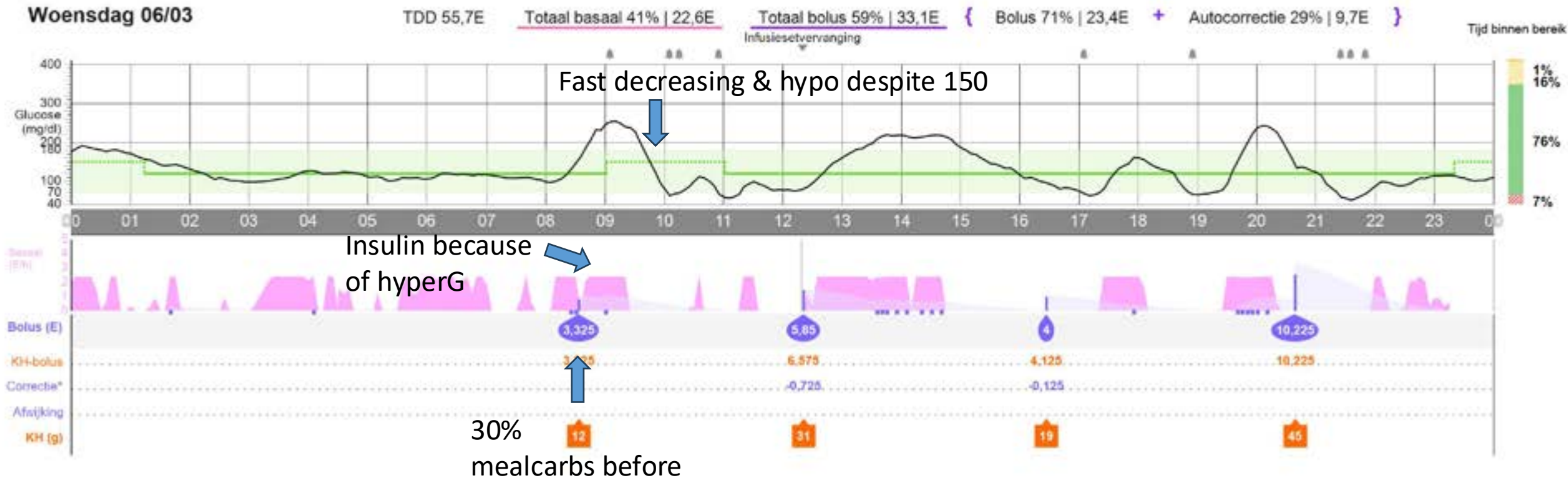
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3. Volg **CGM** waarde TIJDENS inspanning. Neem **kleine KH-porties** (3-20g) **<7 mmol/l**

Case 4

Jef

18 year

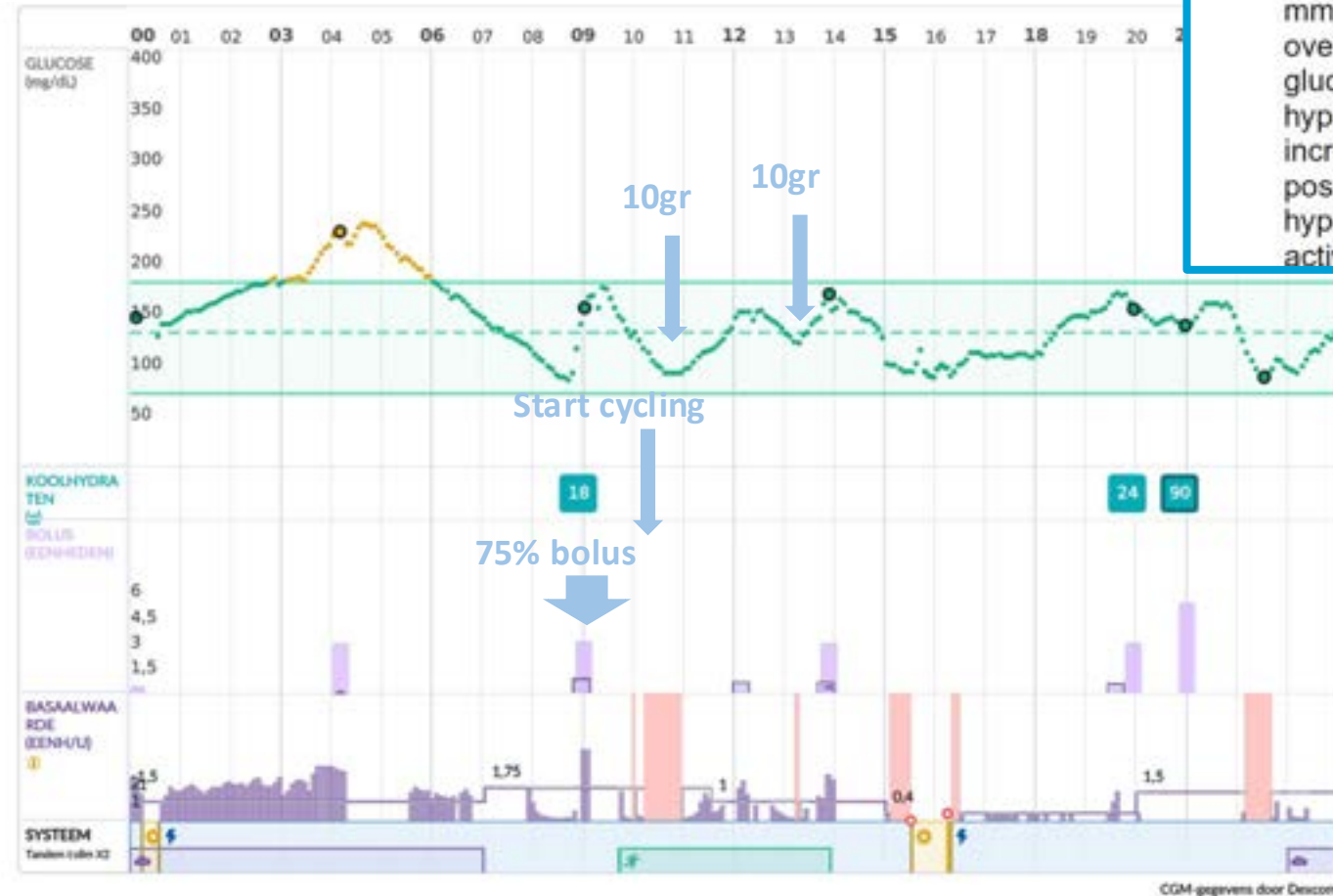
HbA1c 6,8%

TIR 74%

Hobby: Cycling

Problem:

None



3 Pay close attention to CGM readings and trend arrows and initiate small amounts of fast-acting CHO intake (3–20 g) if sensor glucose is <7.0 mmol/l during the activity [31] (D). The overconsumption of CHO may result in a rise in glucose and possibly an AID-predicted hyperglycaemic event, which would result in increased automated insulin delivery and possible subsequent increased risk for hypoglycaemia during or immediately after the activity.

Case 5

Jolien

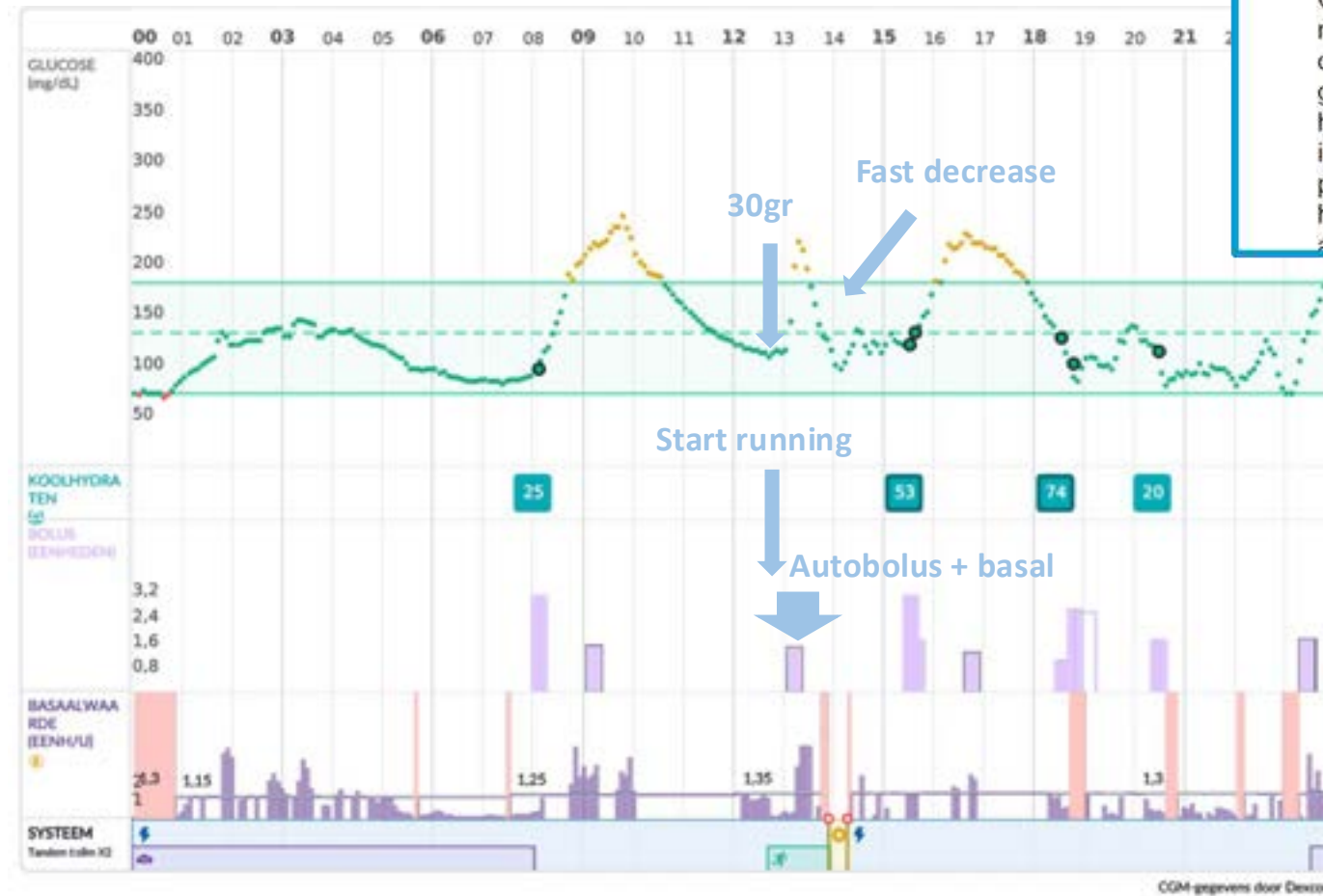
26 year

HbA1c 7,4%

TIR 68%

Hobby: Running

Problem:
Glucose Up&Down
during PA



3 Pay close attention to CGM readings and trend arrows and initiate small amounts of fast-acting CHO intake (3–20 g) if sensor glucose is <7.0 mmol/l during the activity [31] (D). The overconsumption of CHO may result in a rise in glucose and possibly an AID-predicted hyperglycaemic event, which would result in increased automated insulin delivery and possible subsequent increased risk for hypoglycaemia during or immediately after the activity.

Advise:

Less carbs (3-20g)

Activate Ex Mode 1-2hrs
before PA

Use personal profile
with
low basal and high ISF

Hoe sporten met AID aanpakken?

Consensus recommendations for PA and AID in type 1 diabetes

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2. Geplande activiteit binnen de 2 uur na KH-rijke maaltijd: **- 25-33% bolus** (als daling verwacht wordt). Hoger streefdoel ervoor opzetten!

3. Volg **CGM** waarde TIJDENS inspanning. Neem **kleine KH-porties** (3-20g) **<7 mmol/l**

4. Niet geplande activiteit: zet **hoger streefdoel** bij start (als daling verwacht wordt) + **eet 10-20 g KH'en**

Case 6

Tania

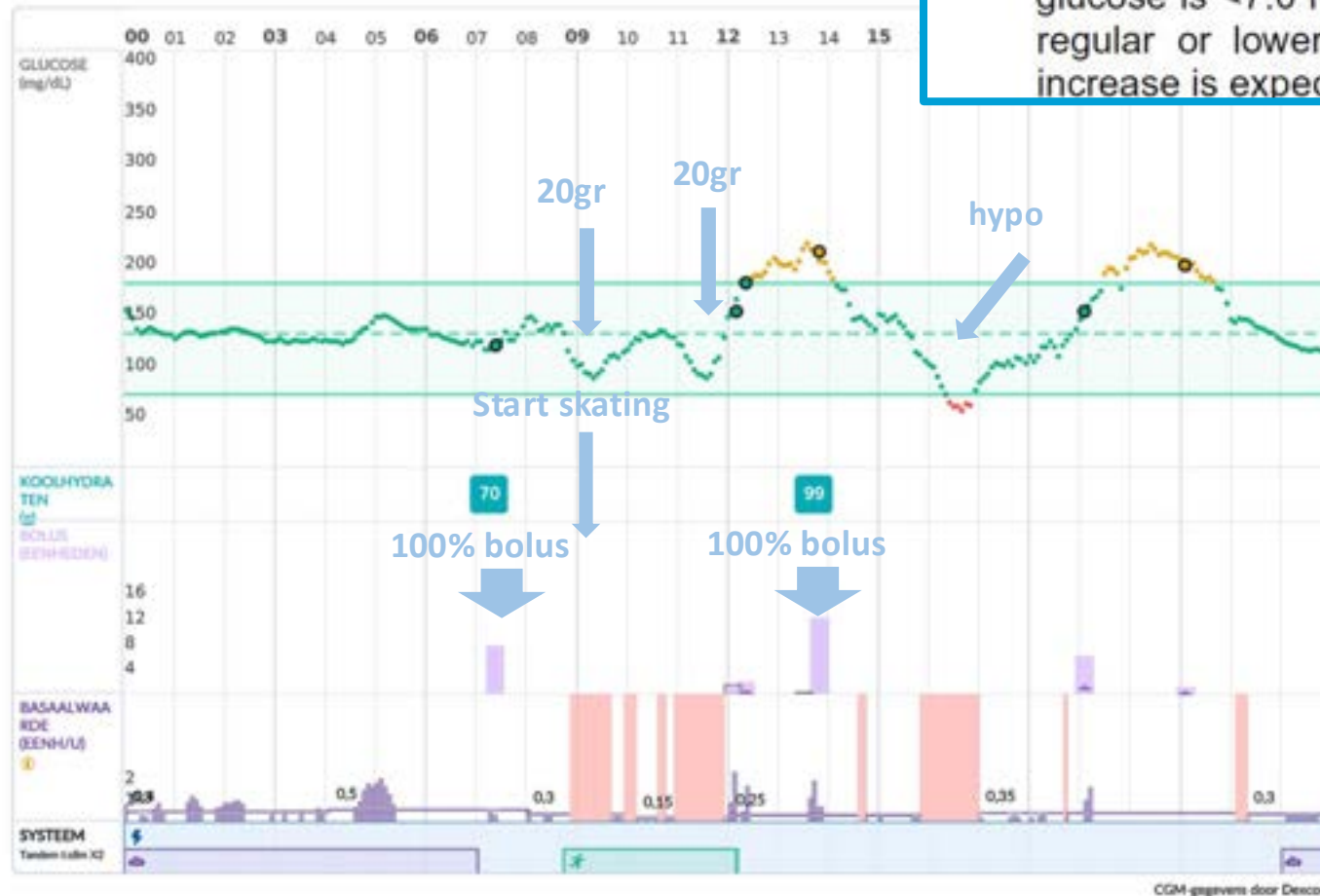
42 year

HbA1c 6,5%

TIR 77%

Hobby: Skating

Problem:
Hyper/Hypo after PA



4

For unplanned PA, set a higher glucose target immediately at the onset of activity if a decrease in glucose or stable glucose is expected and consume 10–20 g of fast-acting CHO if sensor glucose is <7.0 mmol/l [6, 7] (D), or maintain a regular or lower glucose target if a glucose increase is expected (D).

Advise unplanned PA:

Set Ex Mode and Personal Profile (certainly for PA>30min)

Take 10-20gr carbs

Hoe sporten met A1D aanpakken?

Consensus recommendations for PA and A1D in type 1 diabetes

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3. Volg **CGM** waarde TIJDENS inspanning. Neem **kleine KH-porties** (3-20g) **<7 mmol/l**

4. Niet geplande activiteit: zet **hoger streefdoel** bij start (als daling verwacht wordt) + **eet 10-20 g KH'en**

5a. Probeer te sporten wanneer **INSULINE-AAN-BOORD laag** is (nuchter, voor de maaltijd).

case 7

5

Where possible, plan for PA when insulin on board is low [63], such as before meals or in the fasted state [41] **(B)**. Further, low-intensity PA is also recommended when glucose levels are elevated after meals, as these activities tend to bring elevated glucose concentrations to within a target range [64, 65] **(C)**. However, PA should be avoided if glucose is >15.0 mmol/l and blood ketones are >1.5 mmol/l [4] **(D)**.



Hoe sporten met A1D aanpakken?

Consensus recommendations for PA and A1D in type 1 diabetes

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4. Niet geplande activiteit: zet **hoger streefdoel** bij start (als daling verwacht wordt) + **eet 10-20 g KH'en**

5a. Probeer te sporten wanneer **INSULINE-AAN-BOORD laag** is (nuchter, voor de maaltijd).

5b. Bij **hoge suikers: kies voor laag-intense inspanningen**. Pas op als >15 mmol/l en/of ketonen >1,5 mmol/l

Case 8

Tom

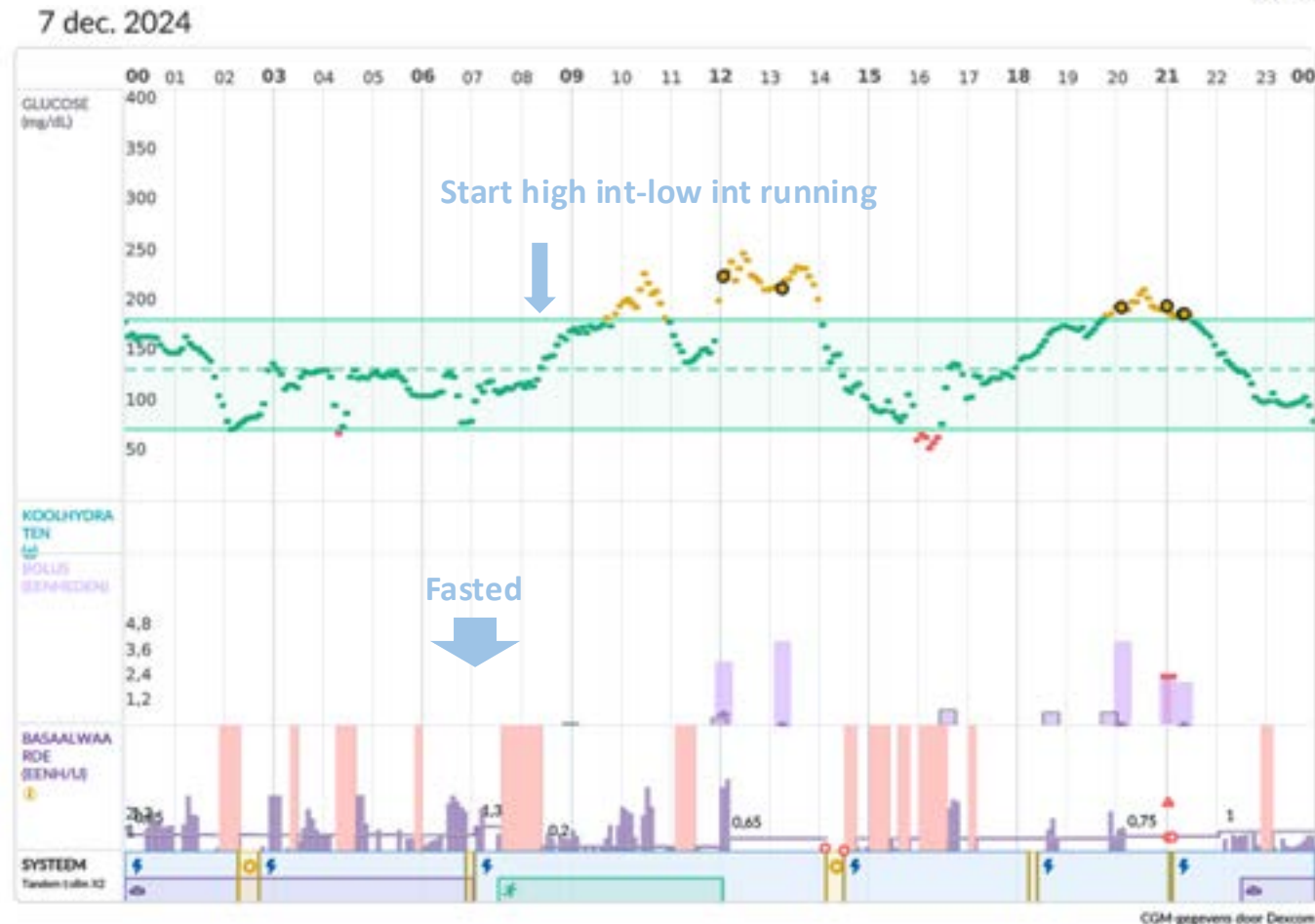
35 year

HbA1c 6,6%

TIR 79%

Hobby: Running

Problem:
Hyper during PA



5

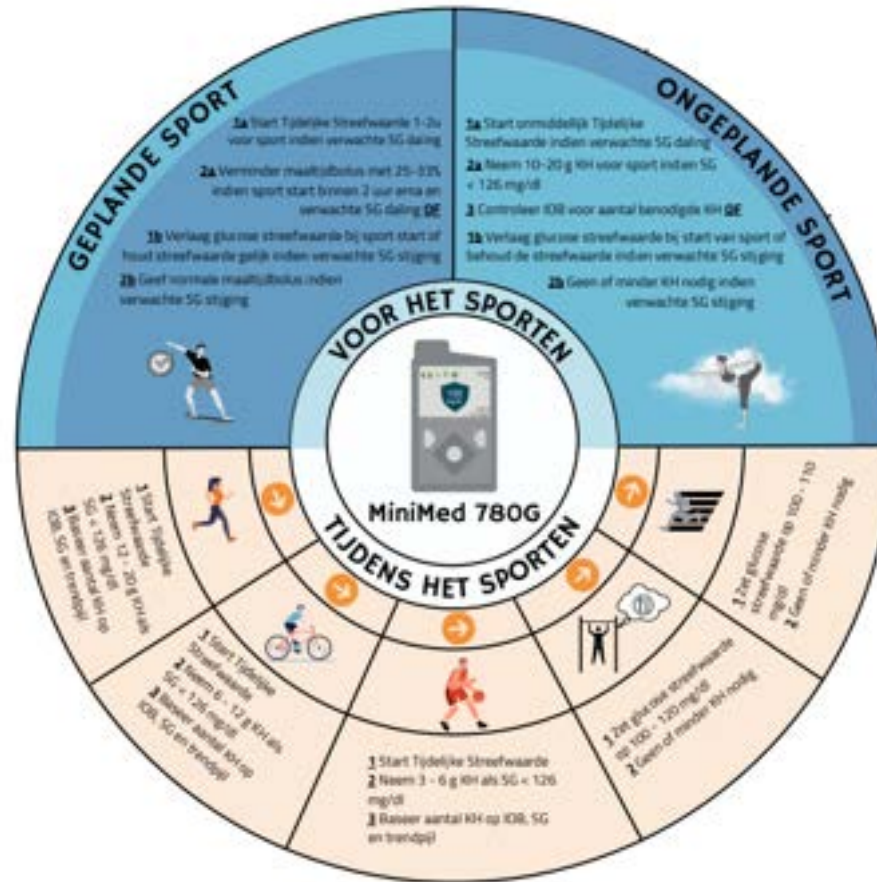
Where possible, plan for PA when insulin on board is low [63], such as before meals or in the fasted state [41] **(B)**. Further, low-intensity PA is also recommended when glucose levels are elevated after meals, as these activities tend to bring elevated glucose concentrations to within a target range [64, 65] **(C)**. However, PA should be avoided if glucose is >15.0 mmol/l and blood ketones are >1.5 mmol/l [4] **(D)**.

Advise: do not activate
Ex mode and profil when
doing HIT training and
IOB is low

Start Low Int. PA when
glucose is increasing

SPORTEN MET AID

Aanbevelingen voor het gebruik van de MiniMed 780G
voor glucose controle tijdens het sporten (mg/dl)



Adapted from Moser et al (2024) Diabetologia DOI 10.1007/s00125-024-06308-z © The International Society of Pediatric and Adolescent Diabetes and the European Association for the Study of Diabetes 2024.

Langdurige sportinspanningen (bijv. ultramarathon, ironman, triatlon, racefiets, langdurig wandelen)

Risico 's

Lage insulinetoediening

Verhoogd risico op ketonen

Risico op hypoglykemie tijdens inspanning

Risico op hyperglykemie

Actie

Overweeg om tijdens de activiteit regelmatisch kleine porties koolhydraten in te nemen

Om insulinetekort tijdens PA te voorkomen, vermijd een hoger glucose streefwaarde gedurende gans de inspanning

Houd CGM nauwlettend in de gaten

Evt **Ketonmeter** bij de hand

Langdurige uitschakeling van de insulinepomp tijdens sport
(bijv. ≥ 120 min uitschakeling van de pomp voor contactsporten en/of activiteiten op het water)

Risico

- Lage insulinetoediening
- Verhoogd risico op ketonen
- Risico op hyperglykemie

Acties

- Als praktisch haalbaar, overweeg om de pomp elk uur een kleine hoeveelheid insuline toe te laten dienen
(bv afgifte van $\sim 50\%$ van de 'gebruikelijke basale' dosis per uur tijdens de rust van voetbalwedstrijd)
- Overweeg toediening insuline met pen tijdens inspanning
- Overweeg over te stappen op een patchpomp

Wedstrijdstress (bijv. voetbalwedstrijd)

Risico

- Hyperglykemie voor en tijdens het evenement
- Vertraagde hypoglykemie na inspanning

Actie

- Blijf gehydrateerd
- Glucose streefwaarde niet aanpassen 1-2 uur voor de wedstrijd
- Als de glucose stijgt tot >270 mg/dl, overweeg dan een **handmatige boluscorrectie** (bijv. 50% van de gebruikelijke correctiedosis), eventueel **met pen**

Activiteiten op het water (bijv. zwemmen, surfen, duiken)

Risico

- Gebrek aan communicatie tussen CGM en AID
- Hypoglykemie

Acties

- Overweeg voor het **Omnipod 5-systeem** om de Pod en de sensor dichterbij elkaar te houden
- Vermijd hoge IOB bij het begin van activiteiten op het water
- Evt. elk uur opnieuw AID aansluiten of pentoediening voor een kleine hoeveelheid insuline
- Zorg dat er snelwerkende glucose direct beschikbaar is

Contactsporten (bijv. worstelen, rugby, voetbal, jiu-jitsu, waterpolo, platformduiken)

Risico

- Reactie op stress
- Apparaten die loskomen
- Gebrek aan comfort

Acties

- Houd rekening met de locatie van het apparaat voor meer comfort
- Overweeg waar mogelijk loskoppelen AID als kans op beschadiging van de pomp
- Gebruik patches en tape om het CGM- en AID-systeem op zijn plaats te houden
- Als AID losgekoppeld, overweeg insulinetoediening elk uur (~50% van de 'gebruikelijke basale' dosis per uur)
- Waarschijnlijk geen nood aan hoger glucosedoel 1-2 uur vóór de activiteit

Hoge omgevingstemperatuur (bijv. wandelen in de hitte)

Risico

- Meer zweten
- Verhoogde insulineabsorptie
- Verhoogd energieverbruik
- Verhoogd risico op hypoglykemie
- Mogelijke impact op de CGM-nauwkeurigheid

Acties

- Overweeg vingerprik in gevallen waarin de nauwkeurigheid van CGM kan worden beïnvloed
- Stel 1-2 uur voor het sporten een hoger glucosedoel in tot het einde van de activiteit
- Verlaag de insulinedosis voor maaltijden of snackbolussen voor en tijdens de activiteit (bijv. 25-33% verlaging)
- Gebruik patches en tape om het CGM- en AID-systeem op zijn plaats te houden

Lage omgevingstemperatuur (bijv. skiën, blootstelling aan kou)

Risico's

- Vernauwing van de perifere bloedvaten
- Minder risico op hypoglykemie op basis van stressrespons op koude, maar hangt waarschijnlijk af van de duur en intensiteit van de activiteit

Acties

- Houd glucosegel en/of insuline in de pomp **dicht bij het lichaam**
- Overweeg glucostabletten die niet kunnen bevriezen
- Signaalverlies is mogelijk met CGM, dus het kan nodig zijn om de apparaten **op te warmen**
- Neem glucosestrips mee bij falen van CGM

Sporten op grote hoogte

(bijv. skiën, wandelen, snowboarden)

Risico

- Hypoxie kan de besluitvorming beïnvloeden
- Impact op stresshormonen
- Schommelende waarden door hypoxie
- Mogelijke impact op de CGM-nauwkeurigheid

Acties

- Bloedglucosemeters en CGM worden aanbevolen voor gecombineerd gebruik (beide kunnen valse waarden geven)
- Blijf gehydrateerd
- Kortdurende blootstelling aan grote hoogte kan insulineresistentie veroorzaken door sympathische stimulatie, maar insulineresistentie zal afnemen na enkele dagen
- Boven de 5000 m wordt er meer cortisol aangemaakt en dus meer risico op hyperglykemie

diaT₁op

Sporten met type 1 diabetes,
yes you can!

Doe mee



Het ontstaan van diaT₁op

DiaT₁op werd opgericht in **2015** als onderzoeksproject van prof. Pieter Gillard, endocrinoloog in UZ Leuven. Continue glucosemetingen stond toen nog in zijn kinderschoenen en voor personen met type 1 diabetes was het niet eenvoudig om te sporten. Omwille van de vele hindernissen, werd het zelfs afgeraden om intensief te bewegen. Door een groep van een **20-tal fietsers** samen te stellen, die samen met **artsen, diabeteseducatoren en diëtisten** gingen trainen, werd er heel veel kennis en ervaring opgedaan. Later op het jaar slaagde iedereen erin om met groot succes de **Stelvio in Italië te beklimmen!**

Na afloop van elk sportjaar voelden de deelnemers zich gezonder, actiever en hebben ze meer zelfvertrouwen bij het managen van hun diabetes tijdens het sporten. Sinds **2021** is diaT₁op een belangrijk onderdeel van [vzw Hippo and Friends](#) waarbij we sterk inzetten op het aanbieden van **educatie en sportieve uitdagingen** in een veilige omgeving.

Steun ons



2019 Lopers



2019 Wandelaars





2019 Fietzers



Wat ga je morgen doen om succes te hebben?

