FACULTEIT REVALIDATIE-WETENSCHAPPEN

UHASSELT

Beweging in diabetes

Prof. dr. Dominique Hansen

Inspanning: waarom?

Minimum amount of physical activity for reduced mortality and extended life expectancy: a prospective cohort study

Chi Pang Wen, Jackson Pui Man Wai*, Min Kuang Tsai, Yi Chen Yang, Ting Yuan David Cheng, Meng-Chih Lee, Hui Ting Chan, Chwen Keng Tsao, Shan Pou Tsai, Xifeng Wu*

416 175 individuals **average follow-up of 8·05 years**

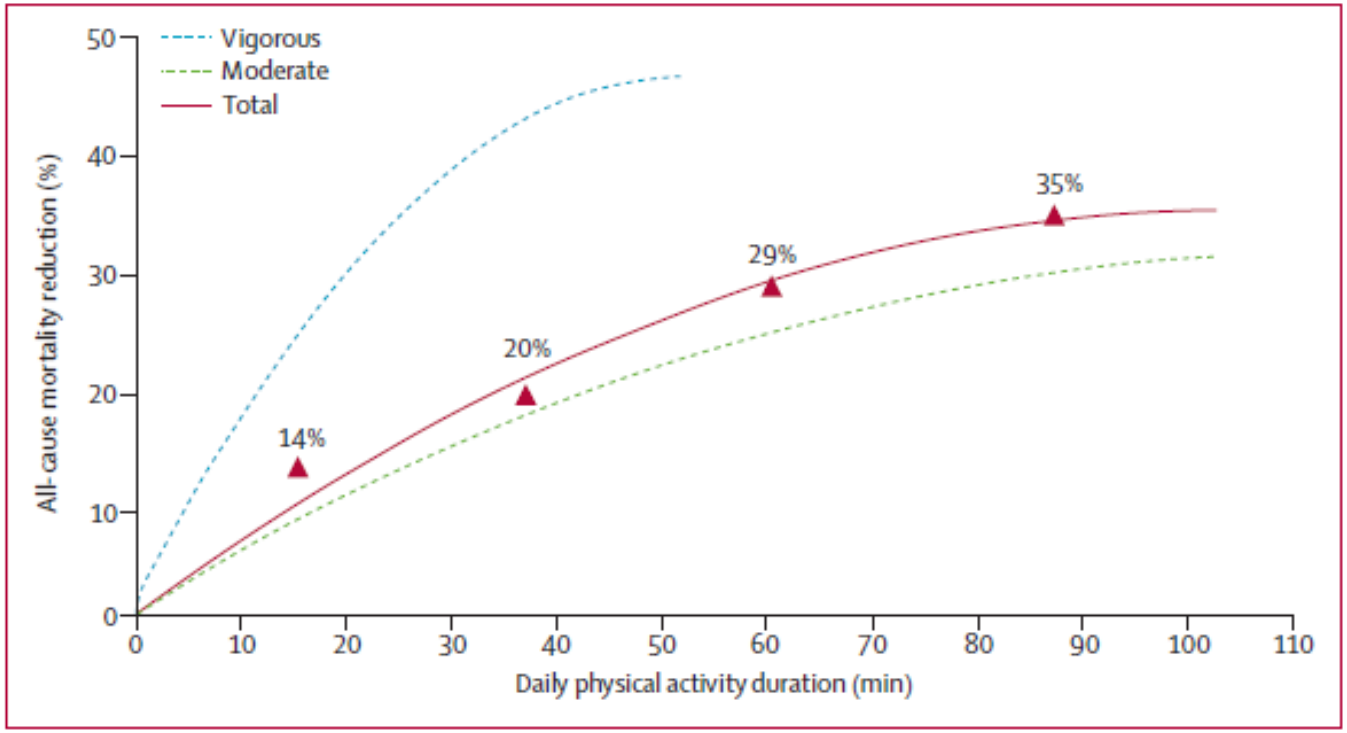


Figure 2: **Daily physical activity duration and all-cause mortality reduction**

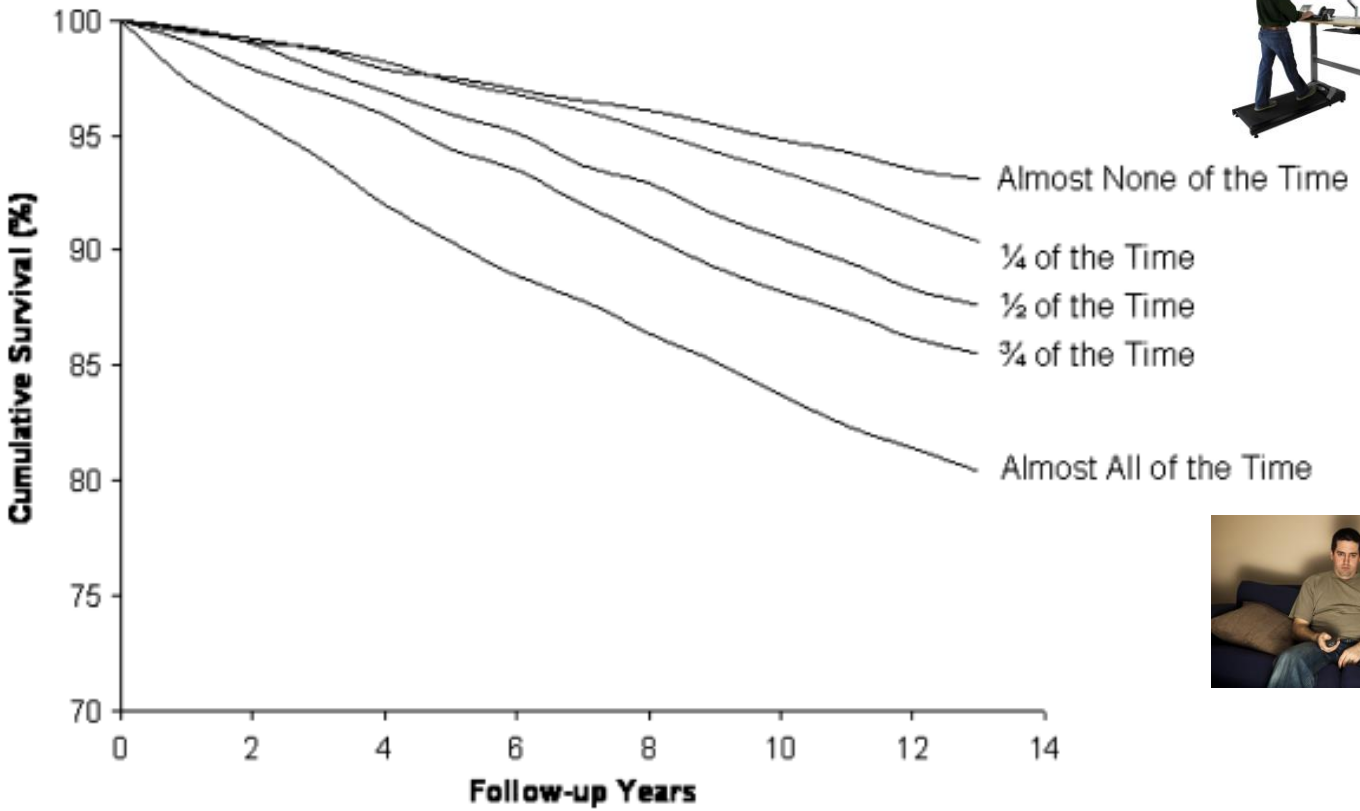
Lancet 2011; 378: 1244-53

Inspanning: waarom?

Leisure Time Spent Sitting in Relation to Total Mortality in a Prospective Cohort of US Adults

Alpa V. Patel*, Leslie Bernstein, Anusila Deka, Heather Spencer Feigelson, Peter T. Campbell, Susan M. Gapstur, Graham A. Colditz, and Michael J. Thun

184,190 participants



FACULTEIT REVALIDATIE-WETENSCHAPPEN

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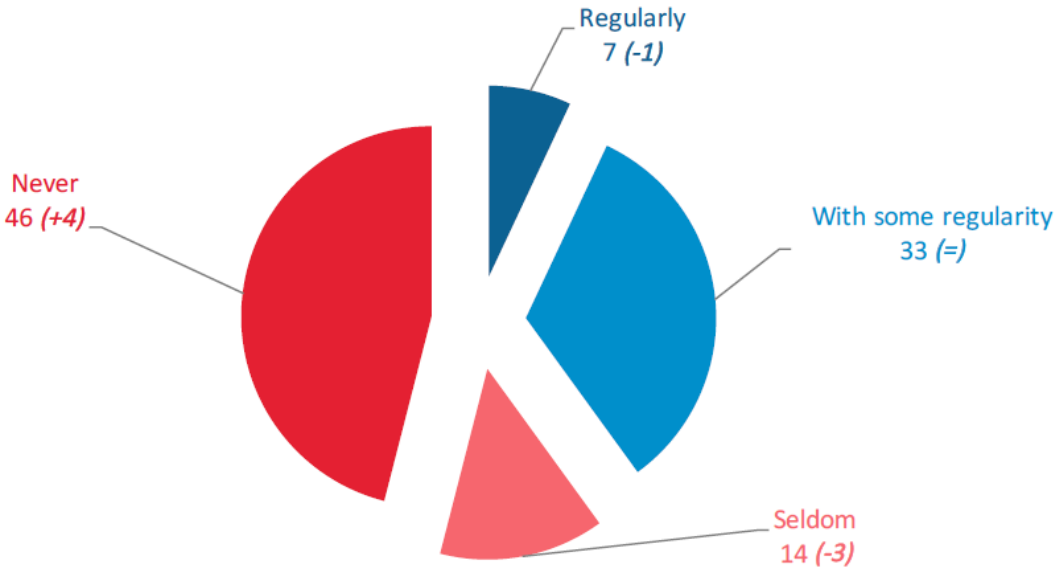
Am J Epidemiol 2010;172:419–429

Inspanning: waarom?

QB1 How often do you exercise or play sport?
(% - EU)



(Dec. 2017 - Nov.-Dec. 2013)

Base: All respondents (N=28,031)

Inspanning: waarom?

	Regularly	With some regularity	Seldom	Never	Don't know
EU28	7	33	14	46	0
Gender					
Men	8	36	16	40	0
Women	7	29	12	52	0
Age					
15-24	9	53	14	24	0
25-39	6	40	19	35	0
40-54	7	32	17	44	0
55 +	8	22	9	61	0
Gender and Age					
Men 15-24	12	59	14	15	0
Men 25-39	6	45	21	28	0
Men 40-54	6	35	20	39	0
Men 55+	8	22	12	58	0
Women 15-24	6	47	14	33	0
Women 25-39	4	36	17	42	1
Women 40-54	7	29	14	50	0
Women 55+	7	21	8	64	0
Education (End of)					
15-	6	14	7	73	0
16-19	6	27	15	52	0
20+	9	43	17	31	0
Still studying	10	63	11	16	0
Socio-professional category					
Self-employed	7	39	18	36	0
Managers	7	46	20	26	1
Other white collars	4	40	19	37	0
Manual workers	6	29	16	49	0
House persons	5	18	10	67	0
Unemployed	10	26	14	49	1
Retired	8	20	9	63	0
Students	10	63	11	16	0
Difficulties paying bills					
Most of the time	4	19	11	66	0
From time to time	5	24	15	55	1
Almost never/ Never	8	37	14	41	0

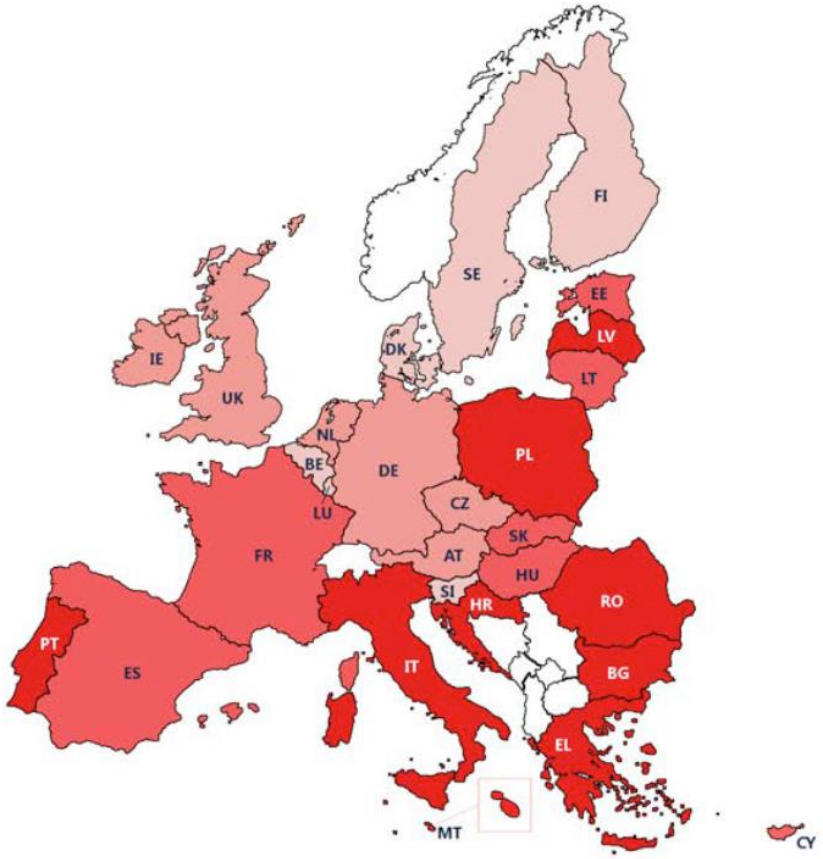
Base: All respondents (N=28,031)

European Opinion Research Group: Eurobarometer Report 2018

Inspanning: waarom?

QB1 How often do you exercise or play sport?
(% - NEVER)

BG	68
EL	68
PT	68
RO	63
IT	62
LV	56
MT	56
PL	56
HR	56
HU	53
LT	51
SK	49
EE	48
ES	46
FR	46
CY	46
EU28	46
CZ	41
AT	40
DE	38
UK	37
IE	34
NL	31
BE	29
LU	27
SI	24
DK	20
SE	15
FI	13



Base: All respondents (N=28,031)

FACULTEIT REVALIDATIE-WETENSCHAPPEN

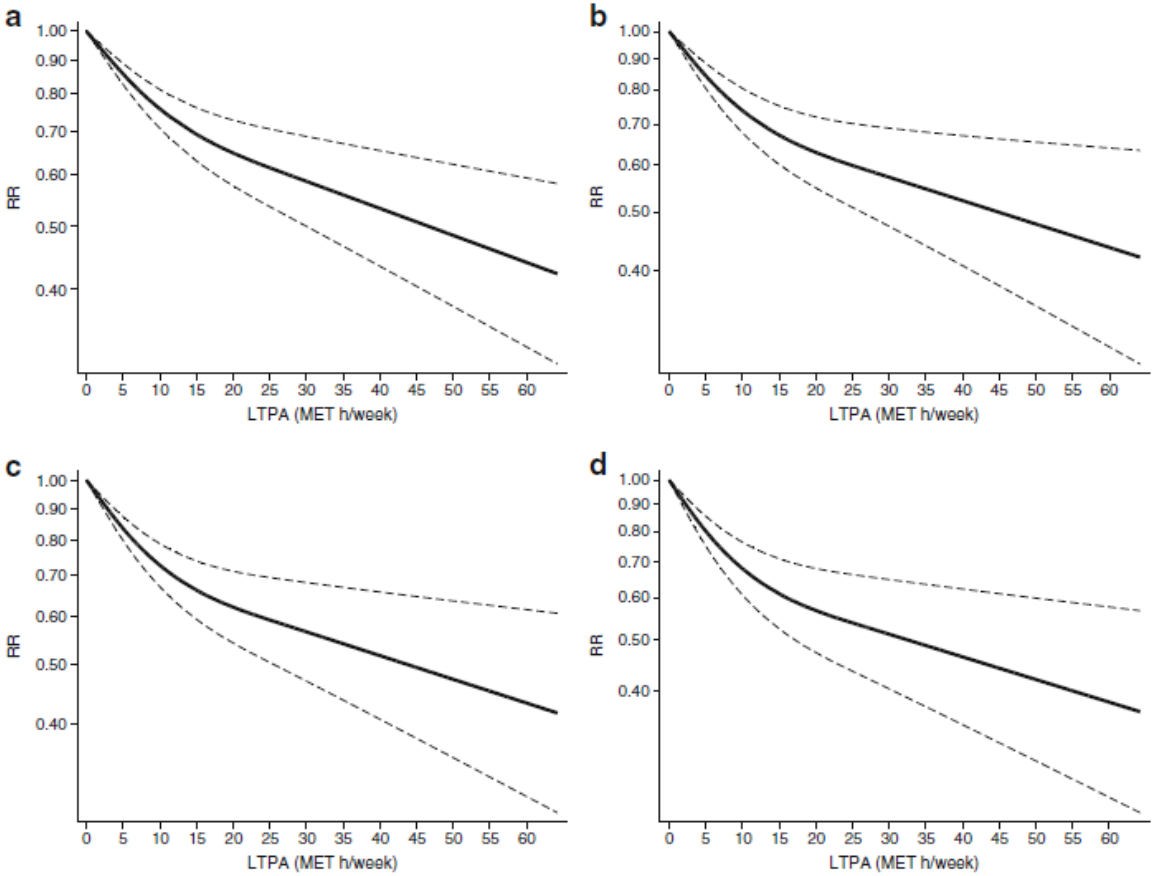
UHASSELT

Is er evidentie voor preventie?

Preventie van type 2 diabetes

Physical activity and incident type 2 diabetes mellitus: a systematic review and dose–response meta-analysis of prospective cohort studies

Andrea D. Smith[1,2] · Alessio Crippa[3] · James Woodcock[4] · Søren Brage[5]



FACULTEIT REVALIDATIE-WETENSCHAPPEN
UHASSELT

Diabetologia (2016) 59:2527–2545

Preventie van type 2 diabetes

Preventing the progression to Type 2 diabetes mellitus in adults at high risk: A systematic review and network meta-analysis of lifestyle, pharmacological and surgical interventions

John W. Stevens [a,], Kamlesh Khunti [b], Rebecca Harvey [a], Maxine Johnson [a], Louise Preston [a], Helen Buckley Woods [a], Melanie Davies [b], Elizabeth Goyder [a]*

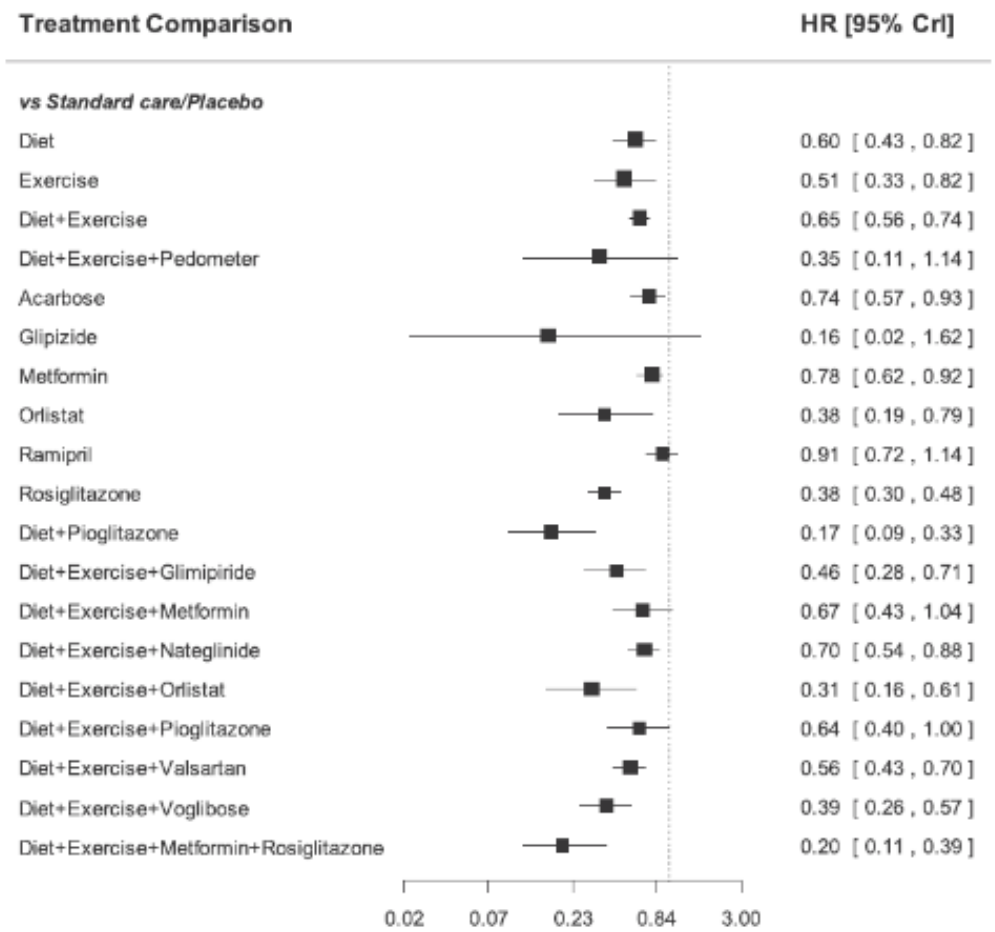


Fig. 4 – Hazard ratios for progression to Type 2 diabetes mellitus: forest plots relative to standard care/placebo.

FACULTEIT REVALIDATIE-WETENSCHAPPEN

UHASSELT

Preventie in type 1 diabetes?

Fear of exercise

No exercise

Increase in fat mass

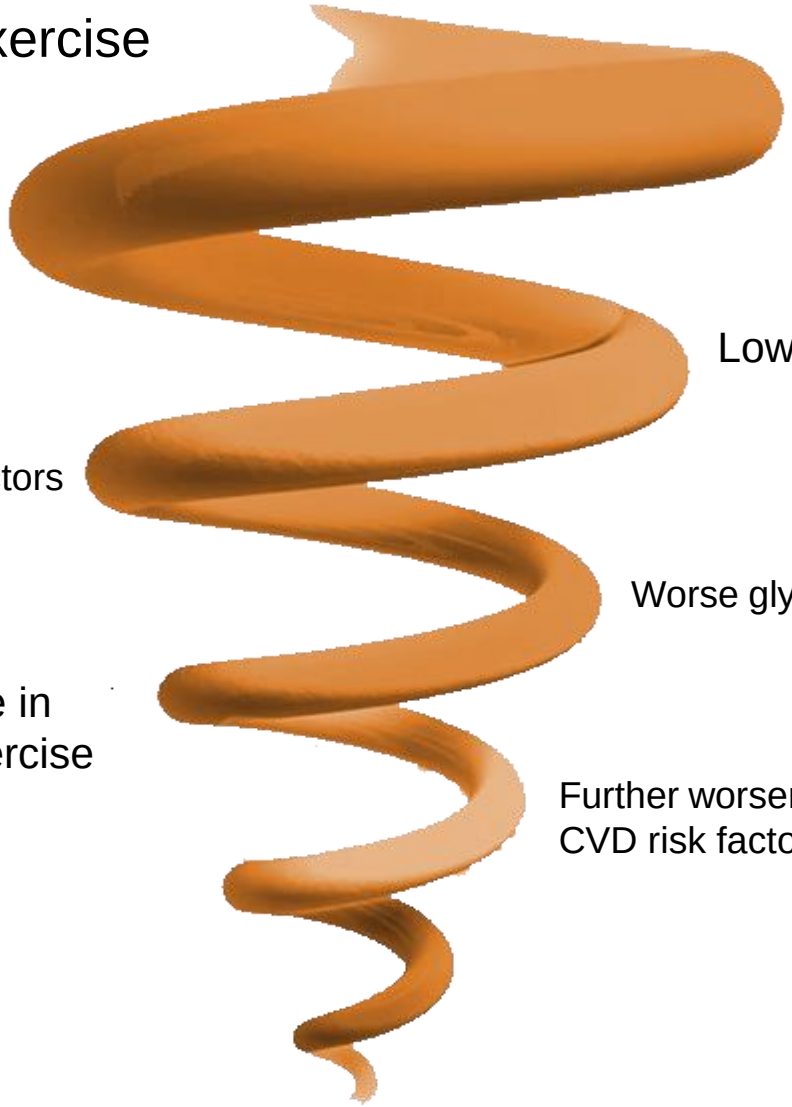
Lowering in endurance capacity

Worsening in CVD risk factors

Worse glycemic control

Further decrease in motivation to exercise

Further worsening in fat mass, exercise tolerance, CVD risk factors and glycemic control



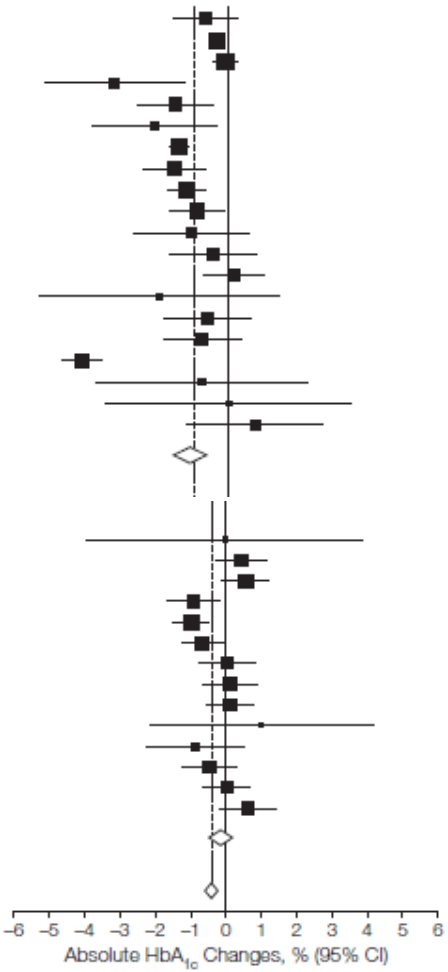
Is beweging effectieve behandeling voor diabetes?

Umpierre D, et al. JAMA 2011; 305: 1790-99

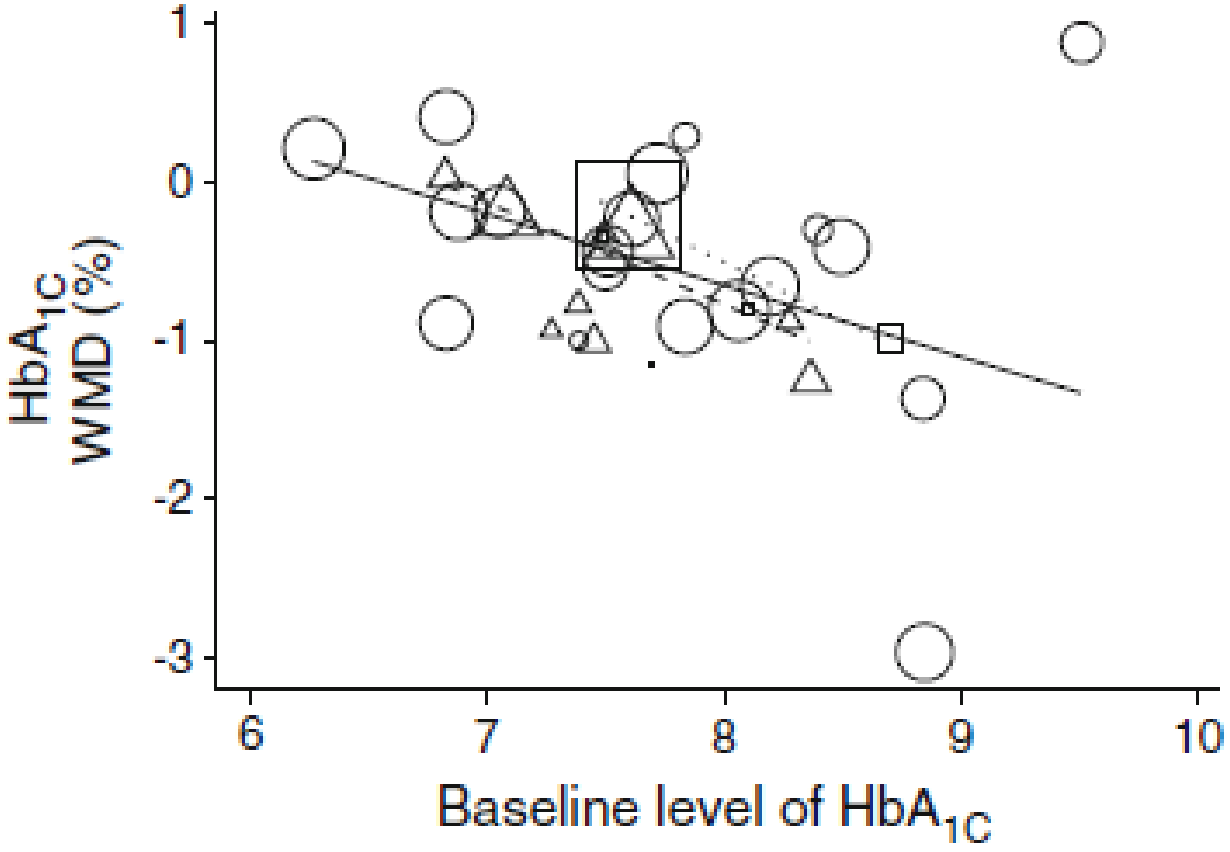
Behandeling van type 2 diabetes

Figure 1. Absolute Changes in HbA_{1c} of Individual Studies of Structured Exercise Training vs No Intervention

Source	No. of Patients: Intervention	No. of Patients: Control	HbA_{1c} Weighted Mean Difference, % (95% CI)	Weight, %
Aerobic training				
Bjorgaas et al,[20] 2005	11	11	−0.44 (−1.03 to 0.15)	3.46
Church et al,[8] 2010	72	41	−0.23 (−0.30 to −0.16)	5.77
Cuff et al,[21] 2003	9	9	−0.07 (−0.28 to 0.14)	5.37
Dela et al,[22] 2004	14	10	−2.14 (−3.43 to −0.86)	1.38
Giannopoulou et al,[23] 2005	11	11	−1.00 (−1.70 to −0.30)	2.96
Goldhaber-Fiebert et al,[24] 2003	33	28	−1.40 (−2.56 to −0.24)	1.61
Kadoglou et al,[25] 2007	29	27	−0.93 (−1.08 to −0.78)	5.57
Kadoglou et al,[26] 2007	28	26	−1.02 (−1.59 to −0.45)	3.55
Kadoglou et al,[27] 2010[a]	22	21	−0.80 (−1.15 to −0.45)	4.68
Kadoglou et al,[27] 2010[b]	23	23	−0.59 (−1.11 to −0.07)	3.81
Lambers et al,[28] 2008	18	11	−0.70 (−1.78 to 0.38)	1.78
Ligtenberg al,[29] 1997	25	26	−0.30 (−1.11 to 0.51)	2.57
Middlebrooke et al,[30] 2006	22	30	0.10 (−0.45 to −0.65)	3.64
Raz et al,[31] 1994	19	19	−0.30 (−3.53 to 0.93)	0.54
Ribeiro et al,[32] 2008	11	10	−0.40 (−1.19 to 0.39)	2.61
Sigal et al,[7] 2007	60	63	−0.50 (−1.22 to 0.22)	2.88
Sridhar et al,[33] 2010	55	50	−2.76 (−3.13 to −2.39)	4.60
Vancea et al,[34] 2009[c]	14	17	−0.50 (−2.47 to 1.47)	0.68
Vancea et al,[34] 2009[d]	9	17	0.00 (−2.30 to 2.30)	0.51
Verity and Ismail,[35] 1989	5	5	0.50 (−0.75 to 1.75)	1.43
All aerobic training I^2 = 92.8%; P for heterogeneity <.001			−0.73 (−1.06 to −0.40)	59.41
Physical activity advice alone				
Brun et al,[53] 2008	13	12	−0.04 (−3.93 to 3.85)	0.16
Cheung et al,[54] 2009	20	17	0.40 (−0.29 to −1.09)	3.49
Diedrich et al,[55] 2010	27	26	0.54 (−0.11 to 1.19)	3.82
Kim and Kang,[56] 2006[a]	22	23	−0.94 (−1.68 to −0.20)	3.19
Kim and Kang,[56] 2006[b]	28	23	−1.02 (−1.51 to −0.53)	5.28
Kirk et al,[57] 2003	26	31	−0.68 (−1.26 to −0.10)	4.40
Kirk et al,[58] 2009[c]	47	35	0.00 (−0.79 to 0.79)	2.88
Kirk et al,[58] 2009[d]	51	35	0.10 (−0.65 to 0.85)	3.13
Krousel-Wood et al,[59] 2008	37	39	0.10 (−0.56 to 0.76)	3.71
Leehey et al,[60] 2009	7	4	1.00 (−2.16 to 4.16)	0.24
Rönnemaa et al,[61] 1986	13	12	−0.90 (−2.25 to 0.45)	1.20
Samaras et al,[62] 1997	13	13	−0.49 (−1.24 to 0.26)	3.10
Tudor-Locke et al,[63] 2004	24	23	0.00 (−0.66 to 0.66)	3.72
van Rooijen et al,[64] 2004	75	74	0.62 (−0.14 to 1.38)	3.09
All advice alone I^2 = 61.2%; P for heterogeneity = .001			−0.16 (−0.50 to 0.18)	41.40
Overall I^2 = 62.9%; P for heterogeneity <.001			−0.43 (−0.59 to −0.28)	100.00



Behandeling van type 2 diabetes

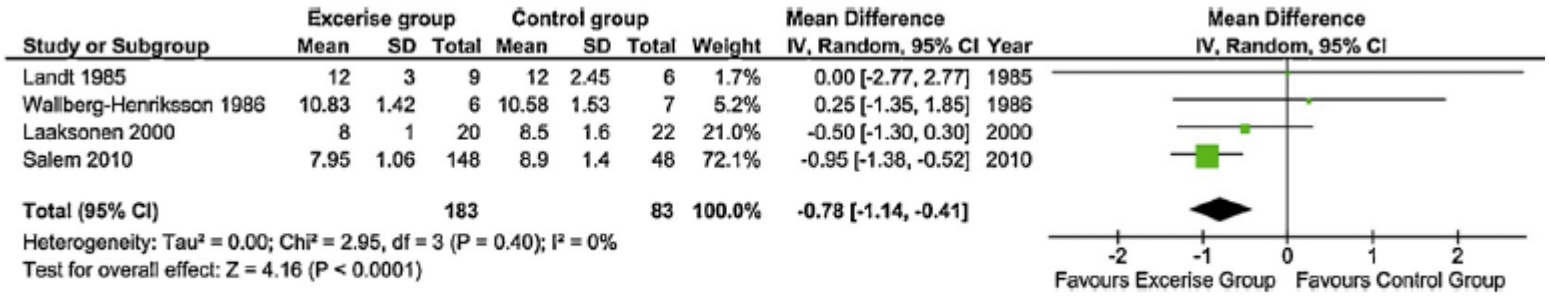


Umpierre D, et al. Diabetologia 2013; 56: 242-51

Behandeling van type 1 diabetes

A systematic review and meta-analysis of exercise interventions in adults with type 1 diabetes

Jane E. Yardley [a,b], *Jacqueline Hay* [a], *Ahmed M. Abou-Setta* [c,d], *Seth D. Marks* [e], *Jonathan McGavock* [a,*]



Study or Subgroup	Excerise group Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Year
Landt 1985	12	3	9	12	2.45	6	1.7%	0.00 [-2.77, 2.77]	1985
Wallberg-Henriksson 1986	10.83	1.42	6	10.58	1.53	7	5.2%	0.25 [-1.35, 1.85]	1986
Laaksonen 2000	8	1	20	8.5	1.6	22	21.0%	-0.50 [-1.30, 0.30]	2000
Salem 2010	7.95	1.06	148	8.9	1.4	48	72.1%	-0.95 [-1.38, -0.52]	2010
Total (95% CI)			183			83	100.0%	-0.78 [-1.14, -0.41]	

Heterogeneity: Tau² = 0.00; Chi² = 2.95, df = 3 (P = 0.40); I² = 0%
Test for overall effect: Z = 4.16 (P < 0.0001)

Fig. 2 – Post-treatment glycated hemoglobin (HbA_{1C})*.

Table 3 – Secondary study outcomes.

Outcome Measure	Trials	Intervention	Control	Effect estimate (95% CI)	I^2 (uCI)
Maximal oxygen uptake [12,22,23]	3	35	35	MD 3.45 (0.59, 6.31)	0% (0%, 88%)
Weight (kg) [21,24]	2	24	19	MD 1.10 (0.11, 2.10)	0%
Body mass index [22,24,26]	3	183	82	MD −0.02 (−0.40, 0.37)	57% (0%, 88%)
Insulin dose (U/kg) [22,26]	2	168	70	MD −0.21 (−0.58, 0.16)	94%
High density lipoprotein [12,21,22,26]	4	183	84	SMD 0.34 (−0.56, 1.23)	85% (63%, 94%)
Low density lipoprotein [12,21,22,26]	4	183	84	SMD −0.02 (−0.29, 0.25)	0% (0%, 70%)
Very low density lipoprotein [12]	1	6	7	MD 0.00 (−0.14, 0.14)	NE
Total cholesterol [12,21,26]	3	163	62	SMD −0.72 (−1.70, 0.27)	77% (24%, 93%)
Total triglycerides [12,21,26]	3	163	62	SMD −0.57 (−1.19, 0.06)	48% (0%, 85%)
Apolipoprotein (a) [12]	1	9	7	MD 0.13 (−0.05, 0.31)	NE
Apolipoprotein (b) [22]	1	20	22	MD −0.07 (−0.19, 0.05)	NE

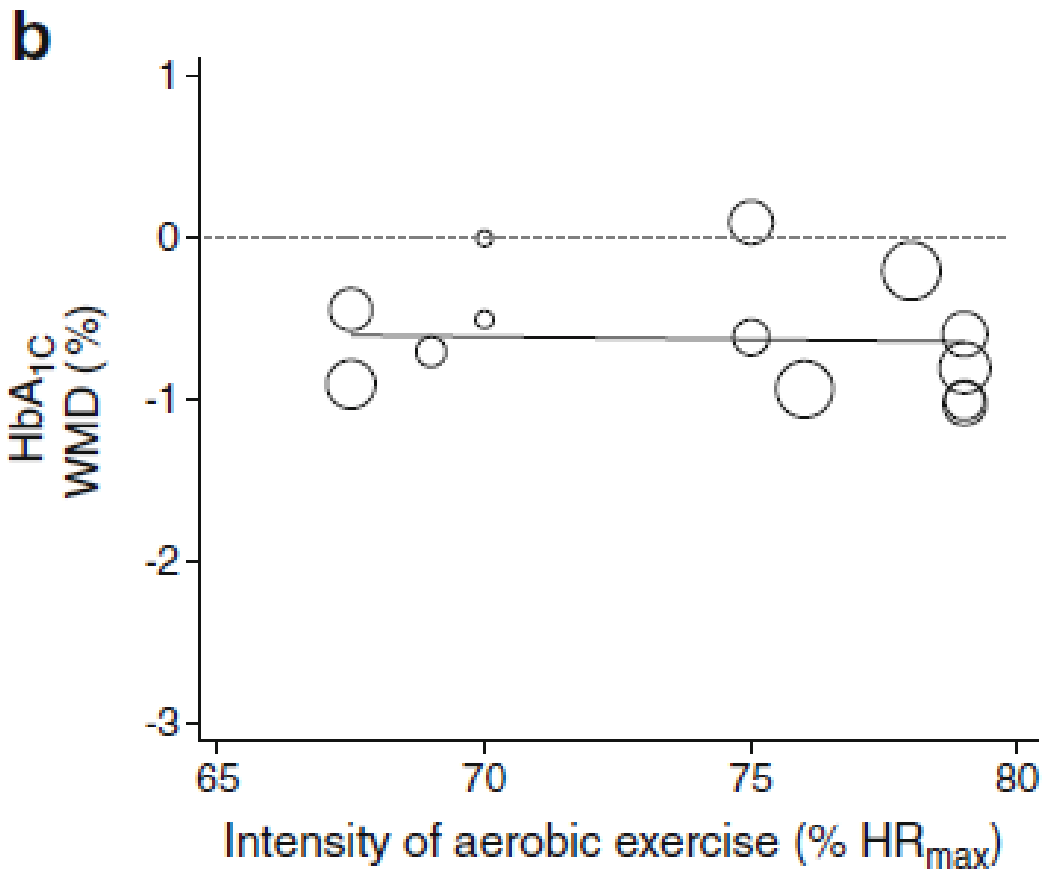
CI = confidence intervals; I^2 = I-squared; MD = mean difference; SMD = standardized mean difference; uCI = uncertainty intervals around the I-squared statistic.

Hoe bewegen?

Inspanning = geneesmiddel

Hoe intens?

Hoe intens?



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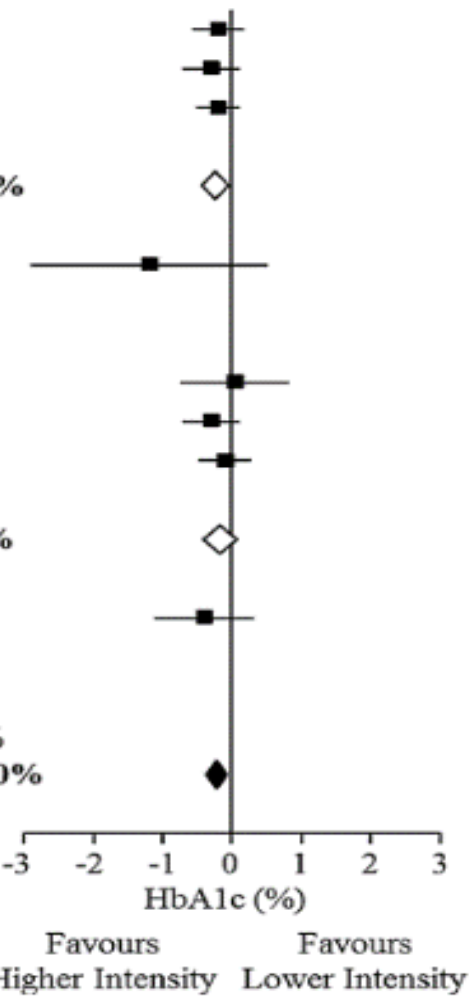
Umpierre D, et al. Diabetologia 2013; 56: 242-51

Hoe intens?

Effect of aerobic exercise intensity on glycemic control in type 2 diabetes: a meta-analysis of head-to-head randomized trials

Yilina Liubaoerjijin[1] · Tasuku Terada[2] · Kevin Fletcher[1] · Normand G. Boulé[1]

Author, year	Higher intensity Mean	SD	Total	Lower intensity Mean	SD	Total	Weight
HIIT vs. MICT							
Karstoft (2013)	-0.1	0.6	12	0.1	0.3	12	17.4%
Mitranun (2014)	-0.5	0.5	14	-0.2	0.6	14	15.0%
Terada (2013)	-0.1	0.3	7	0.1	0.3	7	25.4%
Subtotal			33			33	57.7%
WMD: -0.23 [-0.43, -0.02], p=0.03, Hetero.: Chi^2=0.17, p=0.92, I^2=0%							
HIIT vs. LICT							
Lee (2015)	-2.2	2.6	10	-1	0.9	10	0.90%
WMD: -1.20 [-2.91, 0.51], p=0.17, Hetero.:NA							
HICT vs. MICT							
Chao (2015)	-1.43	0.81	15	-1.47	1.32	15	4.1%
Hansen (2009)	-0.5	0.8	24	-0.2	0.7	25	14.1%
Li (2012)	-0.1	0.7	28	0	0.7	27	18.3%
Subtotal			67			67	36.5%
WMD: -0.16 [-0.42, 0.10], p=0.23, Hetero.: Chi^2=0.77, p=0.68, I^2=0%							
MICT vs. LICT							
Krause (2014)	-0.1	0.6	7	0.3	0.7	6	4.90%
WMD: -0.40 [-1.12, 0.32], p=0.27, Hetero.:NA							
Total			117			116	100.0%
WMD: -0.22 [-0.38, -0.06], p=0.007, Hetero.: Chi^2=2.65, p=0.92, I^2=0%							



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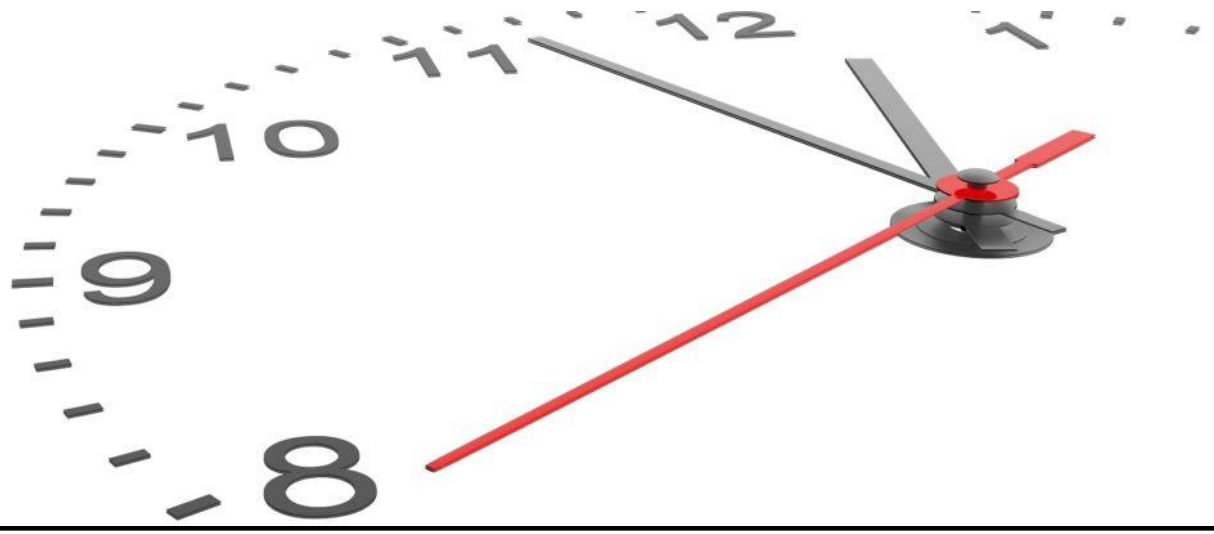
Acta Diabetol (2016) 53:769–781

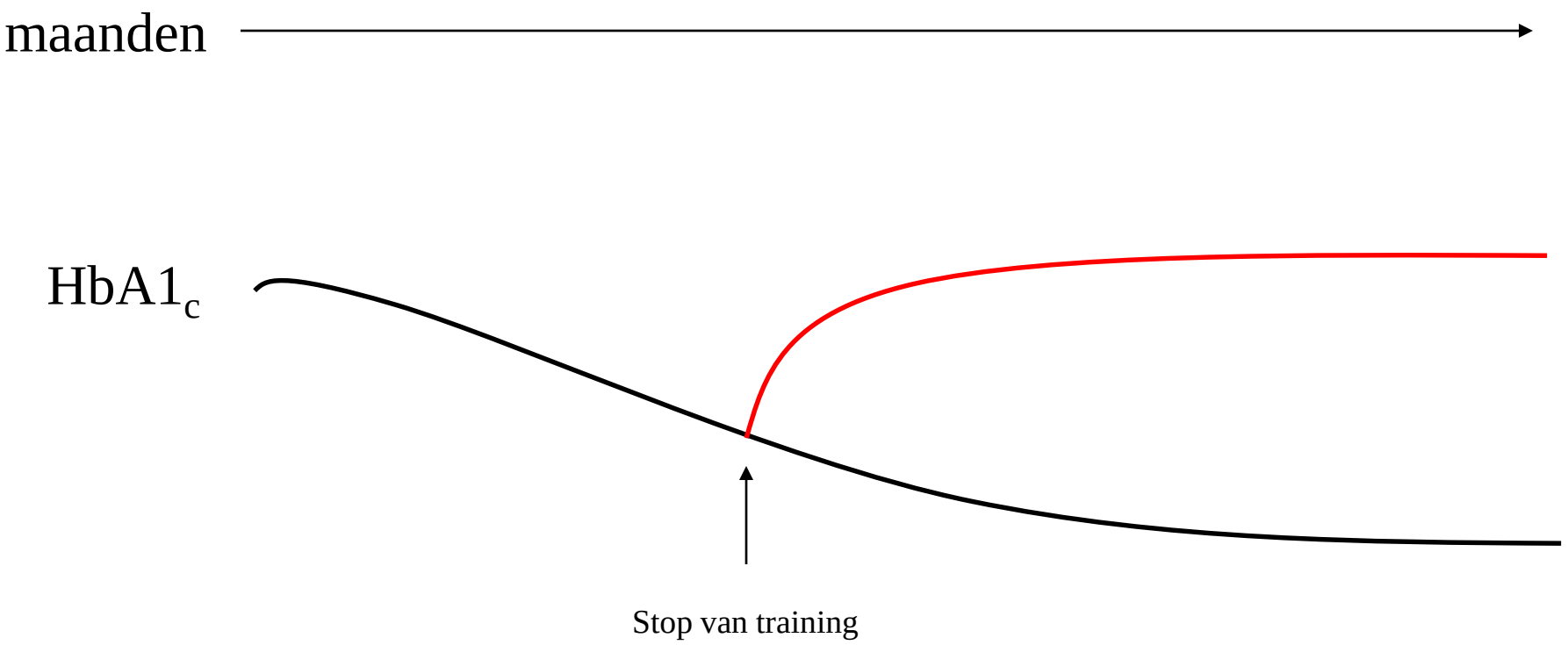
Hoe lang per sessie?

Richtlijnen geven minimum van 30 min/sessie aan

Een langere duur = sterkere daling van bloedsuiker

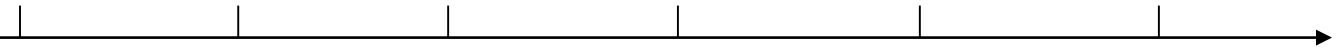


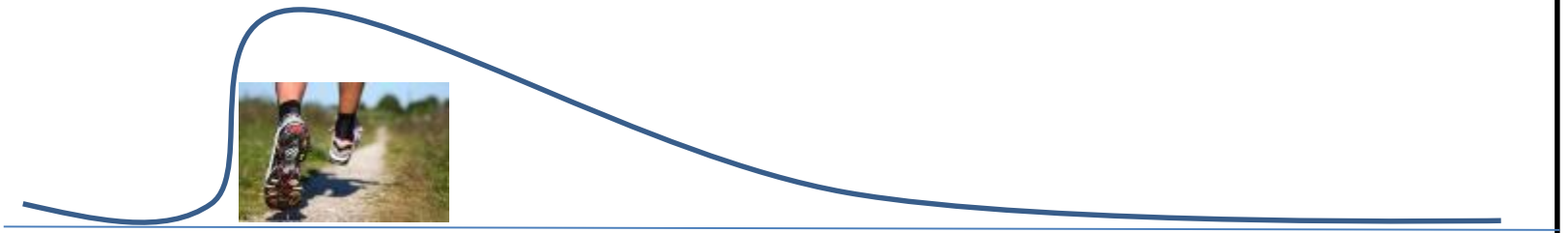
Hoe lang moet een programma duren?



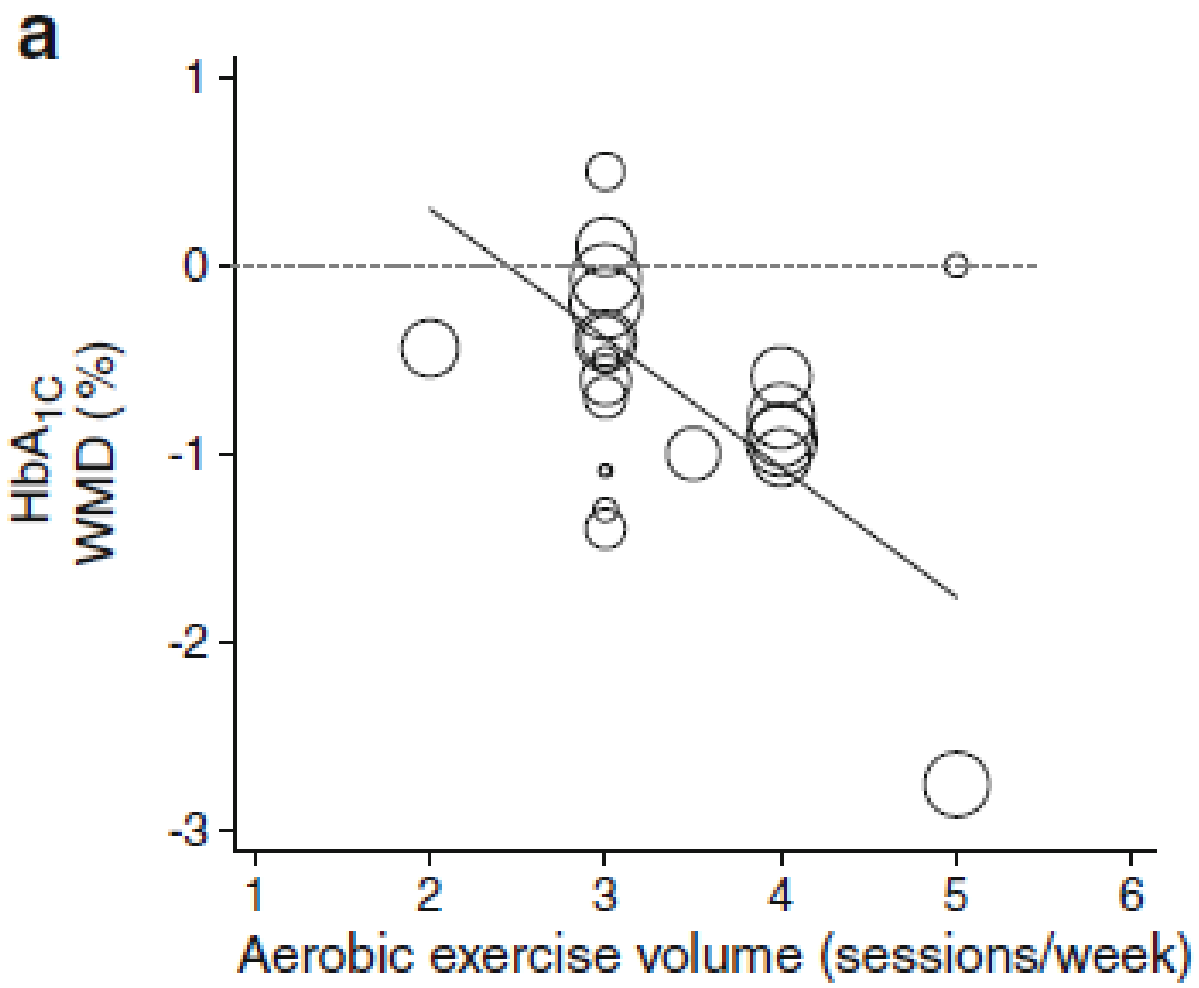
Hoe vaak?

dagen





Hoe vaak?



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Umpierre D, et al. Diabetologia 2013; 56: 242-51

Krachttraining?

Volgens richtlijnen

- Krachttraining moet uitgevoerd worden:
  - 10-15 reps, 3 series, 65-70% 1RM

Krachttraining?

In Search of the Ideal Resistance Training Program to Improve Glycemic Control and its Indication for Patients with Type 2 Diabetes Mellitus: A Systematic Review and Meta-Analysis

Hajime Ishiguro[1] · Satoru Kodama[2] · Chika Horikawa[3] · Kazuya Fujihara[4] · Ayumi Sugawara Hirose[5] · Reiko Hirasawa[1] · Yoko Yachi[6] · Nobumasa Ohara[1] · Hitoshi Shimano[4] · Osamu Hanyu[1] · Hirohito Sone[1]

Table 1 Analysis of the effect size (i.e., change in glycosylated hemoglobin in the resistance training group minus that in the control group) stratified by characteristics of the resistance training program

Characteristic	No. of data	Effect size (95 % CI) [%]	I^2	*P* value (heterogeneity)	*P* value (difference between strata)
Intervention period					
≥12 weeks	12	−0.33 (−0.60 to −0.06)	84.9	<0.001	
<12 weeks	11	−0.39 (−0.62 to −0.17)	46.5	0.04	0.72
Frequency					
≥3/week	17	−0.25 (−0.44 to −0.06)	77.8	<0.001	
<3/week	6	−0.66 (−0.88 to −0.44)	11.7	0.34	0.09
No. of items					
≥9 items	10	−0.54 (−0.90 to −0.19)	49.7	0.04	
<9 items	13	−0.25 (−0.47 to −0.04)	84.1	<0.001	0.24
Intensity					
≥75 % of 1 RM	10	−0.41 (−0.72 to −0.09)	86.8	<0.001	
<75 % of 1 RM	10	−0.30 (−0.51 to −0.09)	53.3	0.02	0.60
Interval					
≥1.5 min	8	−0.47 (−0.88 to −0.06)	91.3	<0.001	
<1.5 min	5	−0.38 (−0.97 to −0.21)	0.0	0.95	0.85
Total sets per bout of exercise					
≥21 sets	10	−0.65 (−0.97 to −0.32)	62.7	0.004	
<21 sets	13	−0.16 (−0.38 to 0.05)	79.8	<0.001	0.03
Total sets per week					
≥60 sets	14	−0.32 (−0.58 to −0.06)	80.9	<0.001	
<60 sets	9	−0.40 (−0.70 to −0.09)	72.6	<0.001	0.09

1 RM 1 repetition maximum, *CI* confidence interval

FACULTEIT REVALIDATIE-WETENSCHAPPEN

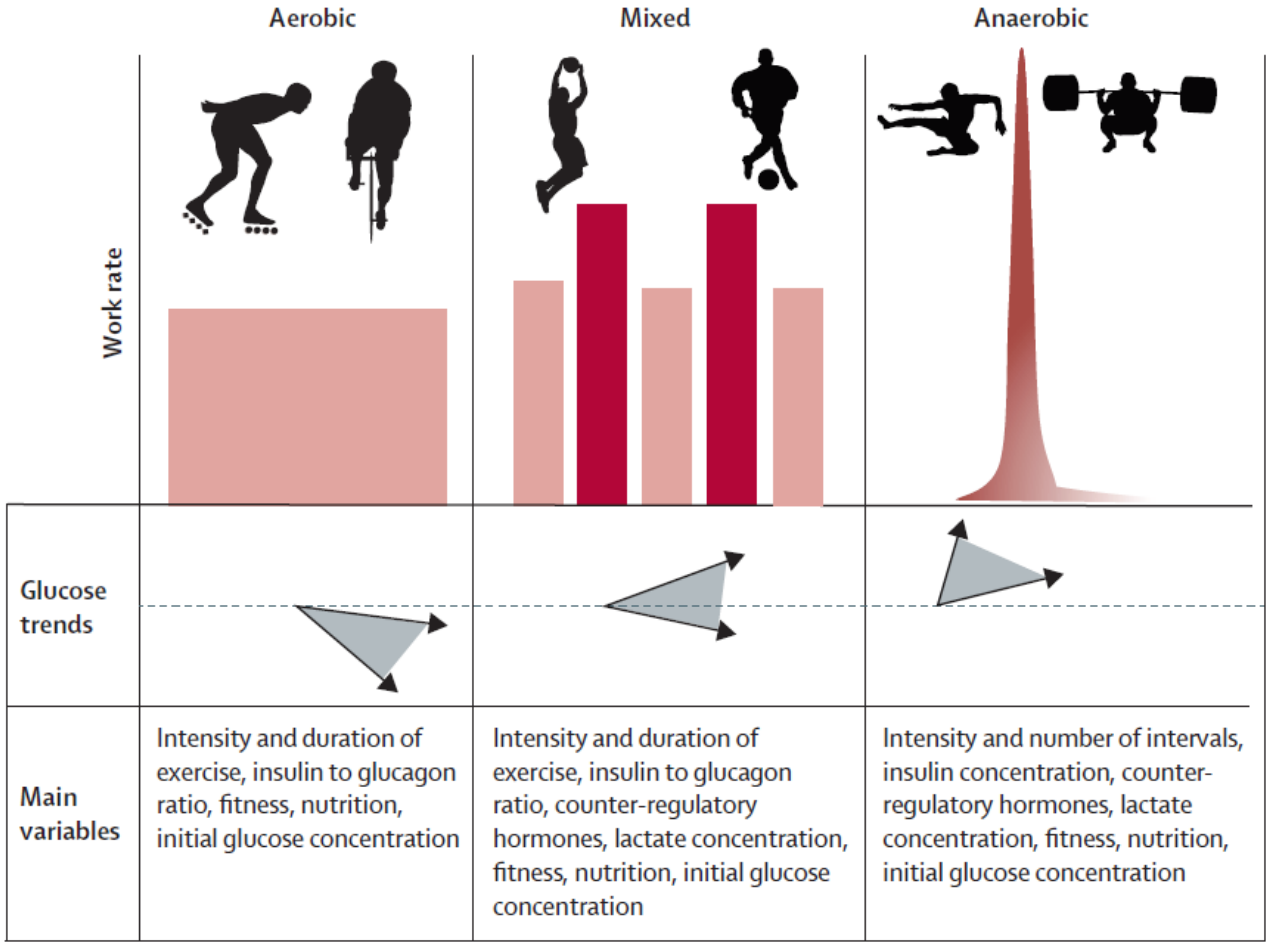
UHASSELT

Sports Med (2016) 46:67–77

Training in type 1 diabetes: hoe?

Exercise management in type 1 diabetes: a consensus statement

Michael C Riddell, Ian W Gallen, Carmel E Smart, Craig E Taplin, Peter Adolfsson, Alistair N Lumb, Aaron Kowalski, Remi Rabasa-Lhoret, Rory J McCrimmon, Corin Hume, Francesca Annan, Paul A Fournier, Claudia Graham, Bruce Bode, Pietro Galassetti, Timothy W Jones, Iñigo San Millán, Tim Heise, Anne L Peters, Andreas Petz, Lori M Laffel



FACULTEIT REVALIDATIE-WETENSCHAPPEN
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Lancet Diabetes Endocrinol 2017

Veiligheid?

Veiligheid?

- Check geneesmiddelen
- Check co-morbiditeiten
- Zorg dat je voorbereid bent op inspanning
- Herken belangrijke symptomen

FACULTEIT
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Andere bewegingsvormen?

The effectiveness of regular leisure-time physical activities on long-term glycemic control in people with type 2 diabetes: A systematic review and meta-analysis

Lee-Wen Pai [a,b], Tsai-Chung Li [a], Yueh-Juen Hwu [b], Shu-Chuan Chang [b], Li-Li Chen [c,d,*], Pi-Ying Chang [b]

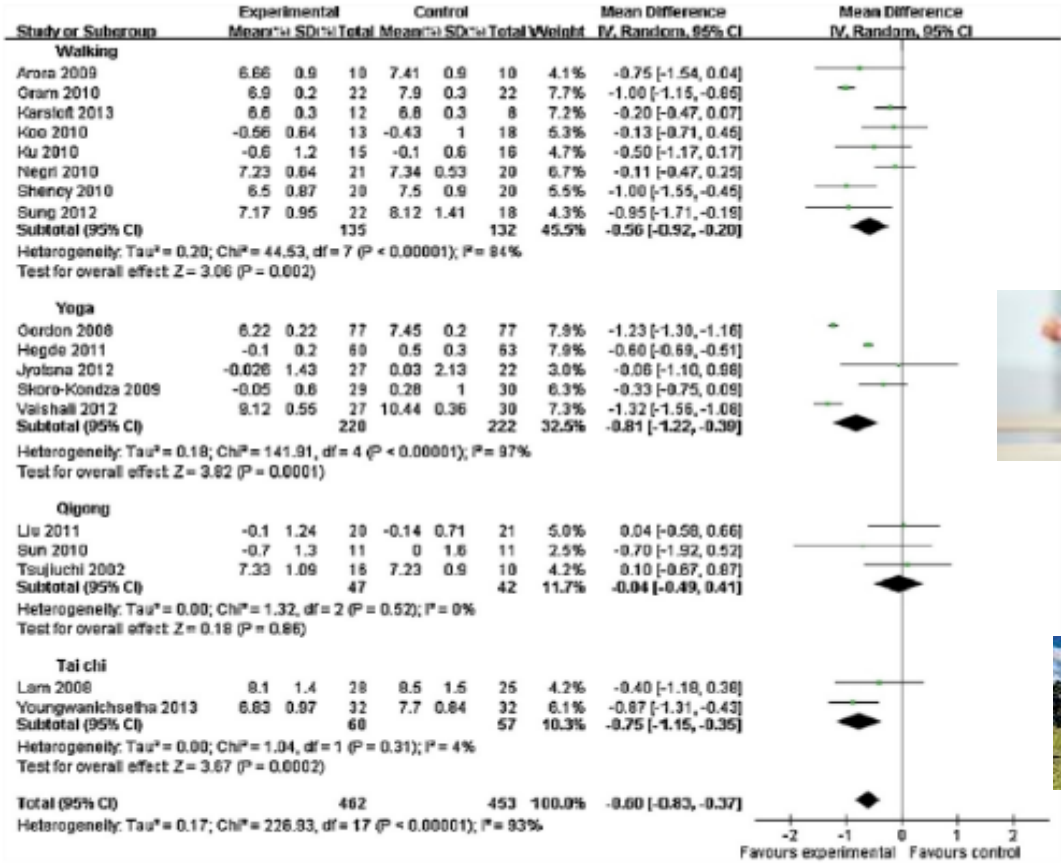

Fig. 3 – Effect of regular leisure-time physical activities on HbA1c levels.

FACULTEIT REVALIDATIE-WETENSCHAPPEN

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Andere bewegingsvormen?

Breaking sitting with light activities vs structured exercise: a randomised crossover study demonstrating benefits for glycaemic control and insulin sensitivity in type 2 diabetes

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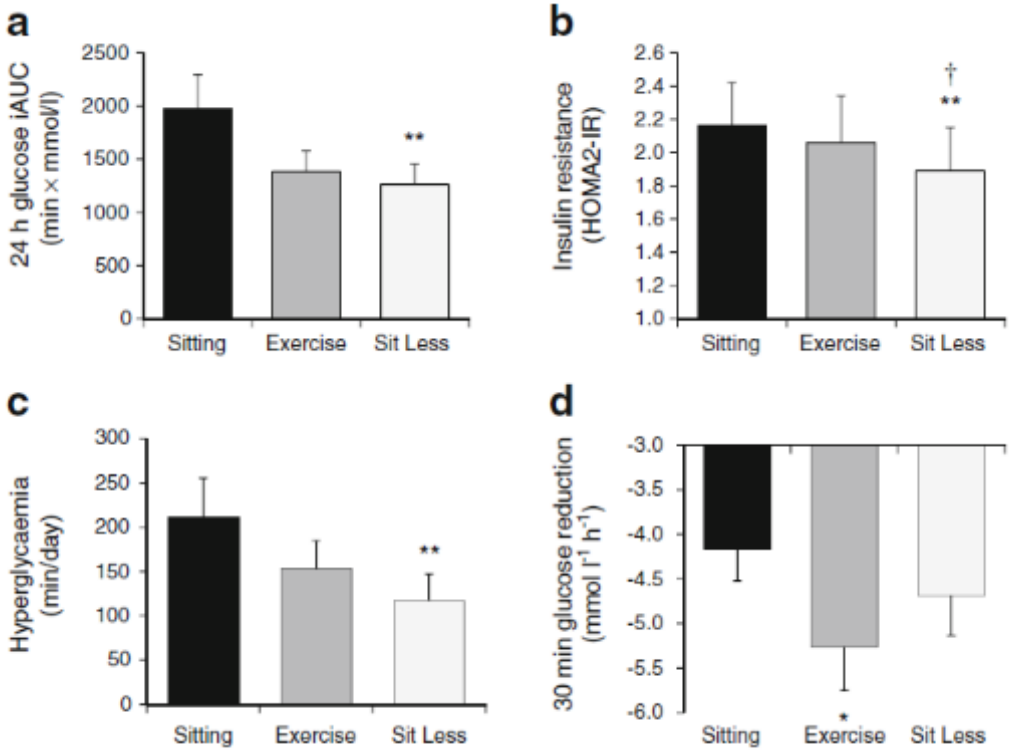

Fig. 3 (**a**) Twenty-four hour glucose iAUC during the last day of each activity regimen, (**b**) insulin resistance expressed as HOMA2-IR on the morning after each activity regimen, (**c**) duration of hyperglycaemia, and (**d**) maximal reduction in glucose level at 30 min during the last day of each activity regimen. Data are estimated means ± SEM ($n = 19$ individuals). *$p \leq 0.05$, **$p < 0.01$ vs Sitting regimen; †, $p \leq 0.05$ vs Exercise regimen

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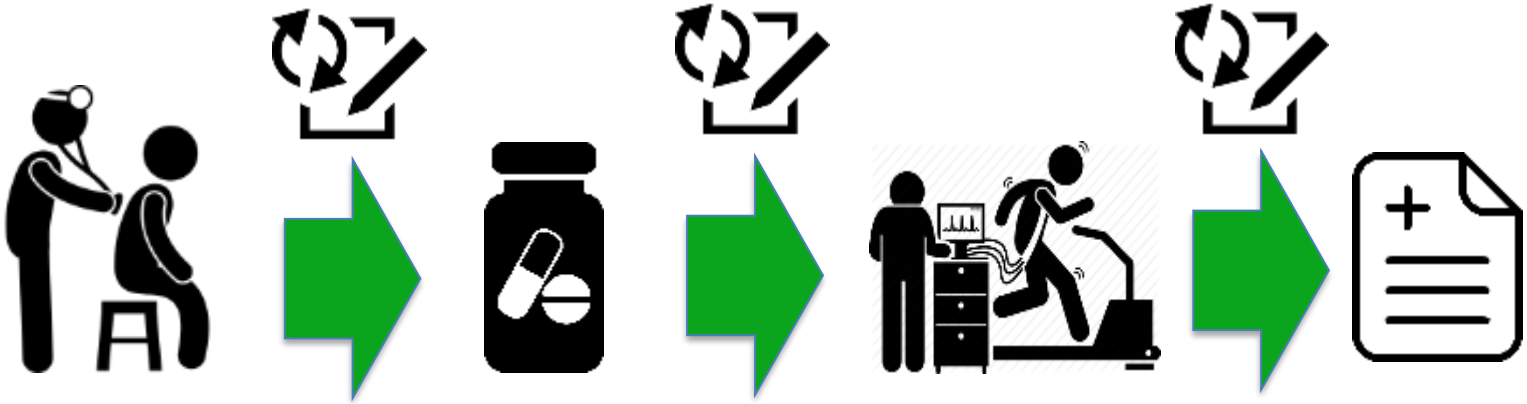
Diabetologia (2017) 60:490–498

Verder finetunen is echter zeer belangrijk



Patient phenotype

Prevalent CV diseases

CVD risk profile
Blood lipid profile
Glycemic control
Fat mass

Medication intake

Physical fitness and exercise response

Exercise prescription

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Hansen D, et al. Eur J Prev Cardiol 2018

THANK YOU
FOR
YOUR ATTENTION