Menopause, lichaamssamenstelling en insulinegevoeligheid

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UNIVERSITEIT GENT

Body composition

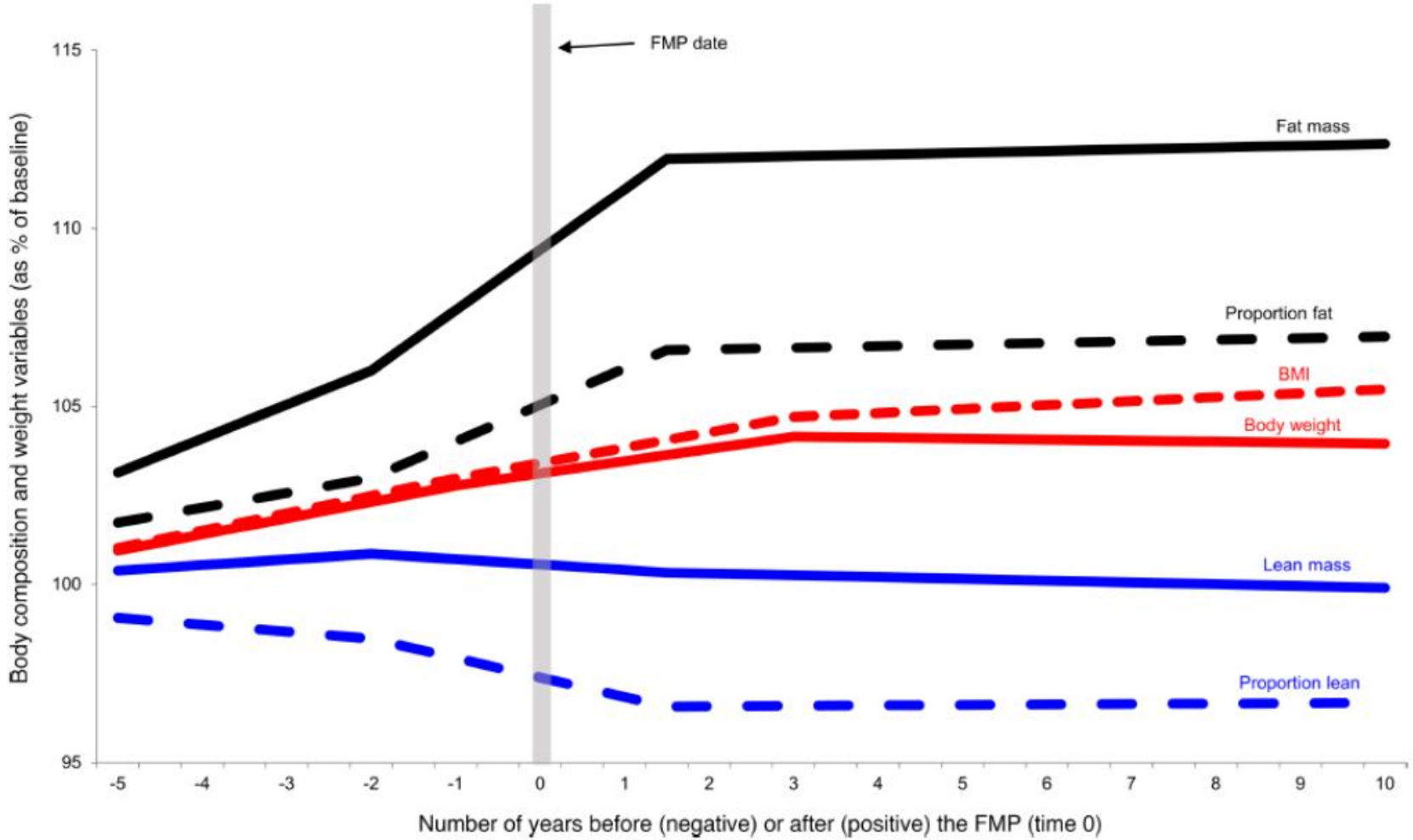

Figure 2. Model-predicted trajectories of body composition and body weight outcomes relative to the time prior to or after the FMP, SWAN. Values shown are for an average study participant (i.e., with each model covariate set at its analysis sample mean). Covariates were age at FMP, race, SWAN study site, and HT use.

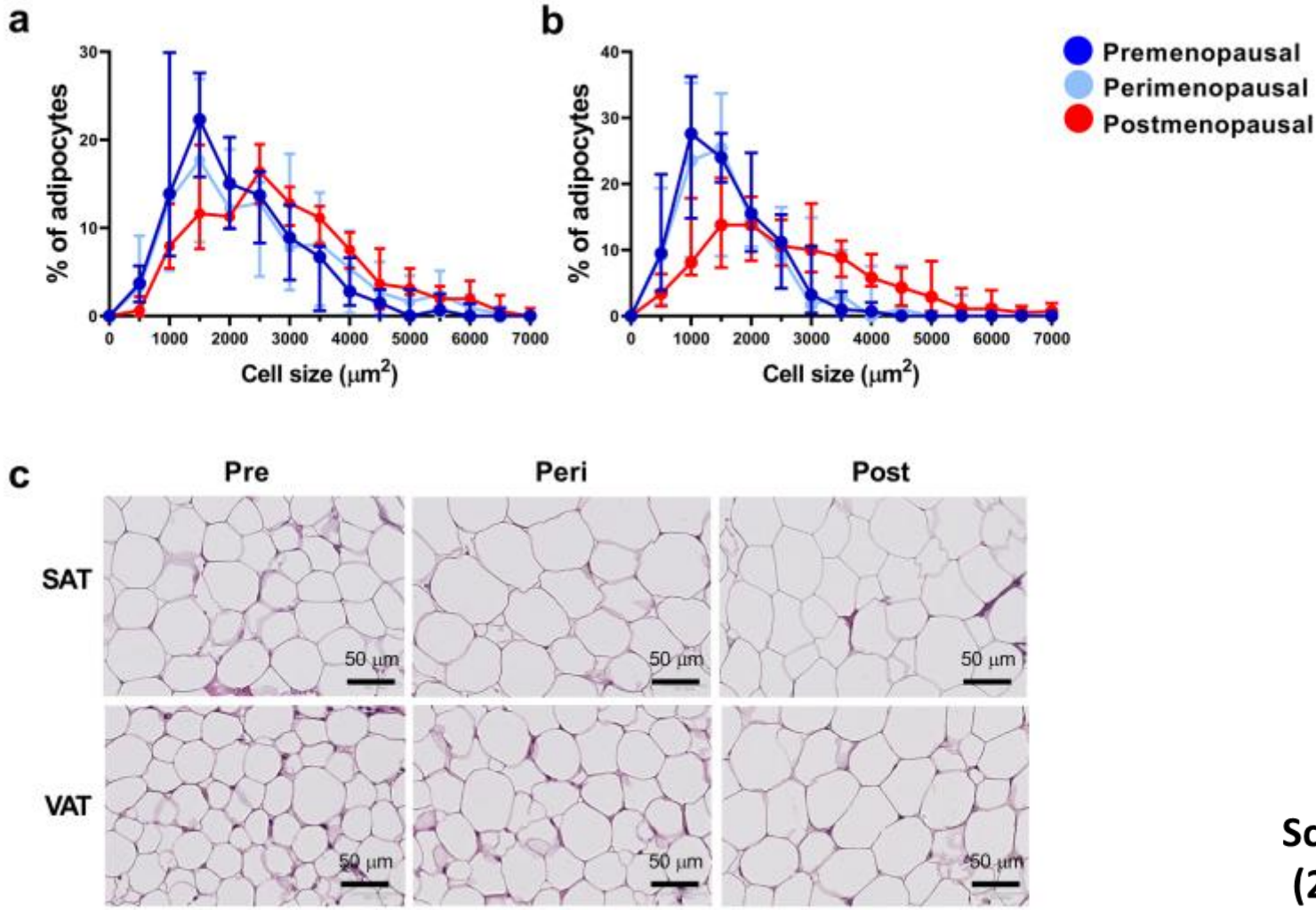

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Table 1. *Subject characteristics*

Variable	Pre $n = 30$	EPeri $n = 31$	LPeri $n = 30$	EPost $n = 26$	LPost $n = 27$	*P* Value
Age, yr	38 ± 6	50 ± 3	50 ± 4	55 ± 3	62 ± 4	**<0.001**
Weight, kg	65.9 ± 9.8	71.3 ± 10.9	67.3 ± 11.9	71.8 ± 12.9	66.6 ± 14.0	0.19
Height, cm	165 ± 6	165 ± 6	166 ± 7	165 ± 6	161 ± 7	0.053
BMI, kg/m^2	24.3 ± 3.8	26.1 ± 3.9	24.5 ± 3.9	26.6 ± 5.1	25.7 ± 5.1	0.21
WC, cm	80.6 ± 8.0	84.4 ± 10.4	82.1 ± 11.9	87.9 ± 13.9	83.5 ± 10.7	0.23
Total lean mass, kg	42.2 ± 3.6	44.3 ± 5.7	40.5 ± 5.1	42.3 ± 6.3	39.0 ± 5.5	**<0.01**
ALM, kg	17.8 ± 1.7	18.7 ± 2.7	16.8 ± 2.7	17.6 ± 3.1	16.0 ± 2.6	**<0.01**
Total fat mass, kg	21.6 ± 7.7	24.7 ± 6.9	24.8 ± 8.1	27.4 ± 8.0	25.7 ± 9.6	0.10
Trunk fat mass, kg	9.5 ± 4.0	12.1 ± 4.2	12.0 ± 4.6	13.2 ± 4.8	12.4 ± 4.9	**<0.05**
Estradiol, pg/mL[a,b]	79 [64, 110]	70 [37, 141]	34 [10, 94]	11 [10, 15]	10 [10, 14]	**<0.001**
Estrone, ng/dL[a,b]	61 [41, 70]	60 [34, 88]	43 [30, 69]	26 [24, 33]	26 [23, 37]	**<0.001**
FSH, μIU/mL[b]	6.5 ± 3.4	22.0 ± 30.0	64.1 ± 35.5	72.1 ± 26.1	84.1 ± 33.3	**<0.001**
Progesterone, ng/dL[a,b]	0.4 [0.2, 0.6]	0.5 [0.2, 0.8]	0.3 [0.2, 0.5]	0.3 [0.1, 0.4]	0.2 [0.1, 0.4]	**<0.01**
Testosterone, ng/dL[a,b]	24 [22, 33]	22 [17, 35]	20 [17, 25]	18 [17, 23]	17 [17, 35]	0.32
$\dot{V}O_{2peak}$, mL·kg^{-1}·min^{-1}[c]	31.2 ± 6.4	28.3 ± 4.8	27.5 ± 5.9	26.3 ± 3.6	24.7 ± 7.2	**<0.001**

Data are means ± standard deviation or [a]median [interquartile range] for *n* subjects. [b]$n = 118$, [c]$n = 139$.ALM, appendicular lean mass; BMI, body mass index; EPeri, early perimenopausal; EPost, early postmenopausal; FSH, follicle stimulating hormone; LPeri, late perimenopausal; LPost, late postmenopausal; Pre, premenopausal; $\dot{V}O_{2peak}$, peak aerobic capacity; WC, waist circumference. Significant *P* values are in bold.

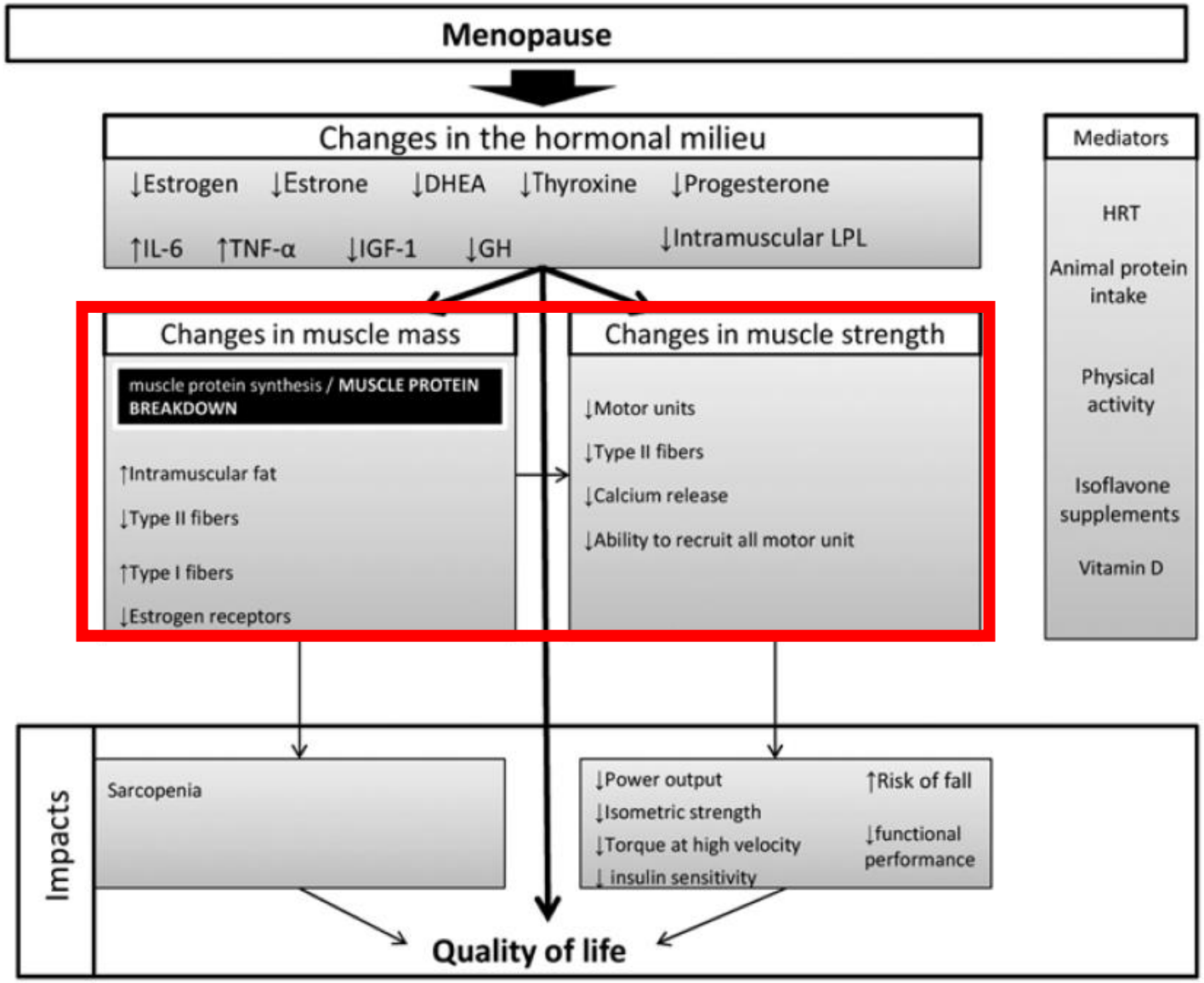


Figure 1. Menopause-related changes on muscle mass and its impacts on different characteristics that contribute to quality of life.

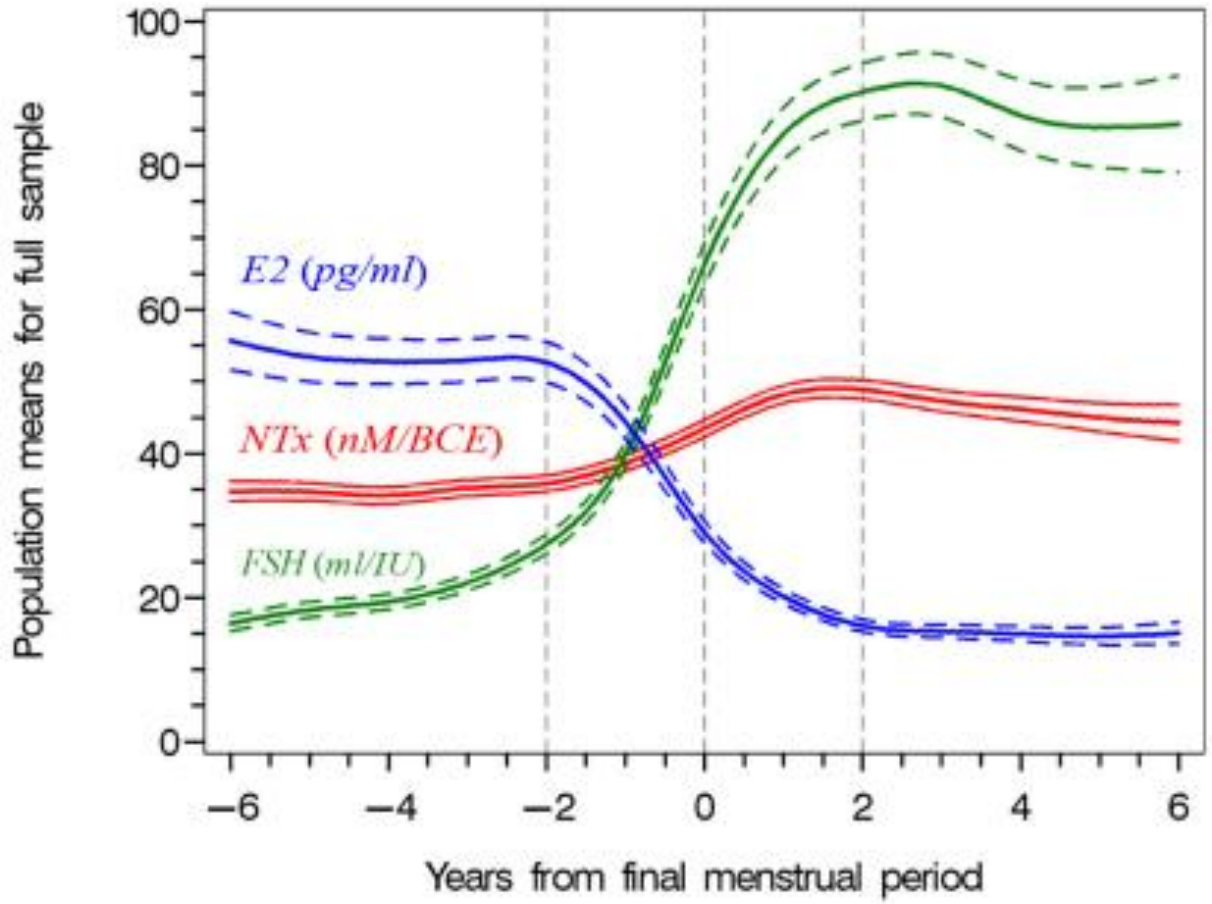


Figure 2. Population mean urine NTX, serum estradiol, and serum FSH levels in relation to years from FMP in the women who experienced a natural FMP (n = 918). The dashed lines denote the 95% confidence intervals.

Table 2. Adjusted means of serum adiponectin, glucose, insulin concentrations and HOMA-R by menopausal status

	Premenopause	Postmenopause	*P*-value for difference
Adiponectin (μg/ml)			
Model 1	8·92 (8·57, 9·29)	10·5 (10·1, 10·9)	0·014
Model 2	9·04 (8·70, 9·39)	10·3 (9·95, 10·7)	0·028
Model 3	9·03 (8·70, 9·37)	10·4 (9·96, 10·7)	0·024
Model 4	9·04 (8·71, 9·39)	10·3 (9·95, 10·7)	0·028
Fasting glucose (mmol/l)			
Model 1	5·206 ± 0·071	5·144 ± 0·071	0·574
Model 2	5·194 ± 0·069	5·156 ± 0·069	0·715
Model 3	5·194 ± 0·069	5·156 ± 0·069	0·684
Model 4	5·172 ± 0·066	5·178 ± 0·066	0·972
Fasting insulin (μU/ml)			
Model 1	5·43 (5·15, 5·72)	6·61 (6·27, 6·97)	0·019
Model 2	5·33 (5·08, 5·60)	6·73 (6·41, 7·07)	0·003
Model 3	5·33 (5·08, 5·59)	6·74 (6·42, 7·07)	0·002
Model 4	5·34 (5·09, 5·60)	6·73 (6·41, 7·06)	0·003
Insulin resistance (HOMA-IR)			
Model 1	1·20 (1·14, 1·28)	1·47 (1·39, 1·56)	0·033
Model 2	1·18 (1·12, 1·25)	1·50 (1·42, 1·58)	0·006
Model 3	1·18 (1·12, 1·24)	1·50 (1·42, 1·58)	0·005
Model 4	1·18 (1·12, 1·24)	1·50 (1·42, 1·59)	0·005

HOMA

What Can I Do?

Hormone

Replacement

Therapy

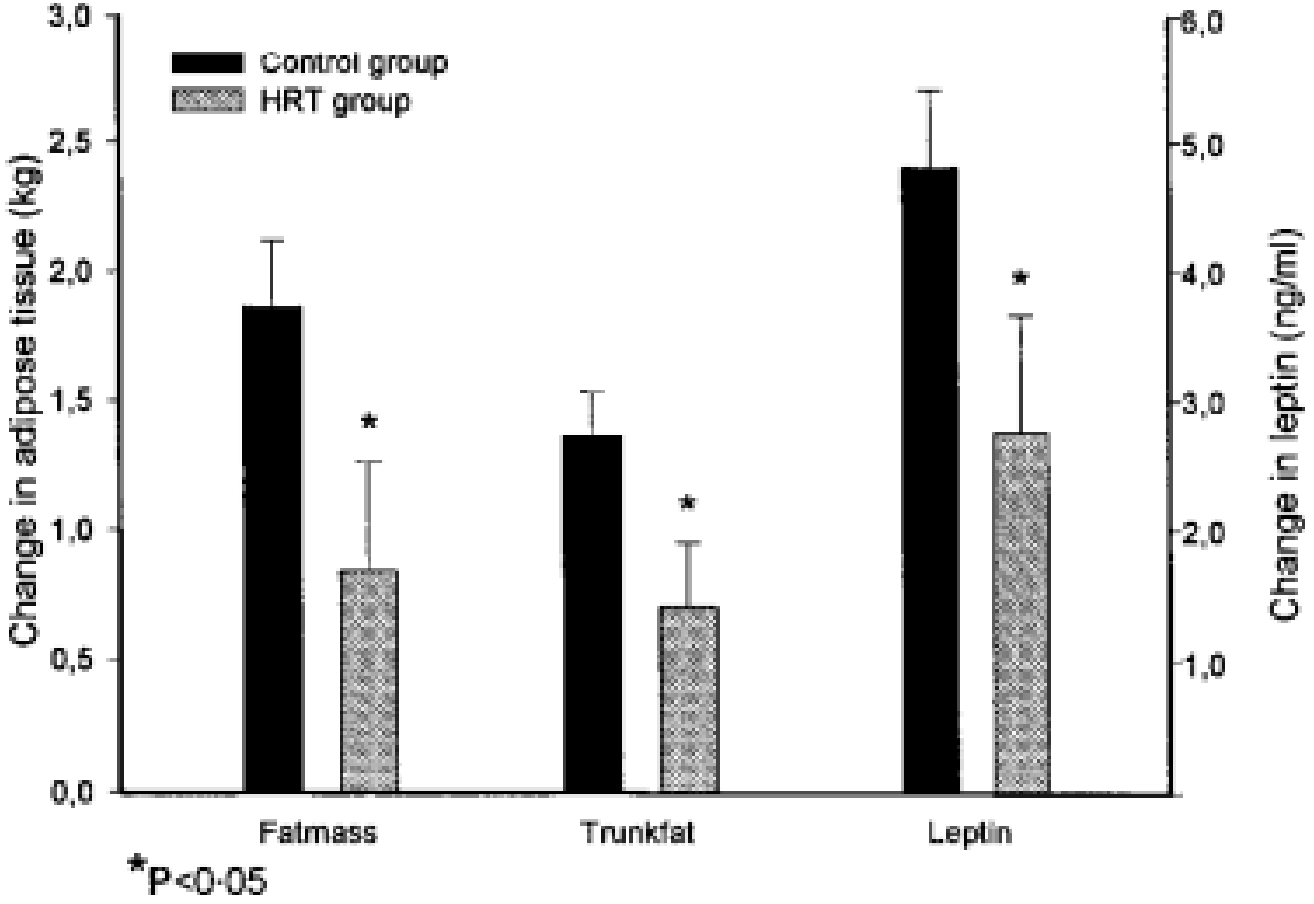


Figure 1 Effects of 5 years of HRT on the changes in fat mass, trunkfat and serum leptin.

Table 2. Changes in body composition and oestradiol during HRT and placebo

	Change during placebo	Change during HRT
Weight (kg)	−0.164 ± 1.40	−0.025 ± 2.14
Lean body mass (kg)	−0.996 ± 1.58*	+0.347 ± 0.858†
Total BMC (g)	−4.38 ± 58.7	+28.9 ± 30.1†
Total BMD (mg/cm)	−3.88 ± 20.4	+8.63 ± 29.0
Abdominal fat mass (kg)	+0.253 ± 0.641	−0.185 ± 0.594†
Total fat mass (kg)	+0.836 ± 1.34*	−0.401 ± 1.98
Percentage of fat mass (%)	+1.24 ± 1.66*	−0.50 ± 1.63†
Estradiol (pmol/liter)	+40.4 ± 153	+673 ± 407†

Table 2: Effects on HRT on Fasting Plasma Glucose (FPG), HbA1C, Insulinemia & HOMA - IR

	Women on HRT (*n* = 20)	P value	Women not on HRT (*n* = 20)	P value	P* value
FPG (mmol/l) Baseline 12 months	7.8 ± 0.86 6.9 ± 0.6	p< 0.001	8.0 ± 0.9 7.8 ± 1.1	P=0.66	P*< 0.0001
HbA1C % Baseline 12 months	7.6 ± 0.54 7.2± 0.43	p<0.001	7.9 ± 0.5 7,7 ± 0.4	p=0.477	P*< 0.0001
Insulinemia (µU/ml) Baseline 12 months	12.2 ± 3.41 10.4 ± 2.92	p<0.001	12.3 ± 3.2 13.1 ± 3.7	p= 0.08	P*<0.0001
HOMA – IR (µU/ml-mmol/l) Baseline 12 months	4.23 ± 1.7 3.18 ± 1.4	P<0.001	4.31 ± 1.8 4.54 ± 1.7	P=0.69	P*<0.0001

P < 0.05 statistically significant for all postmenopausal women included in adequate group at baseline and after 12 months; P* < 0.05 statistically significant for group comparison at 12 months.

EXERCISE/PHYSICAL ACTIVITY

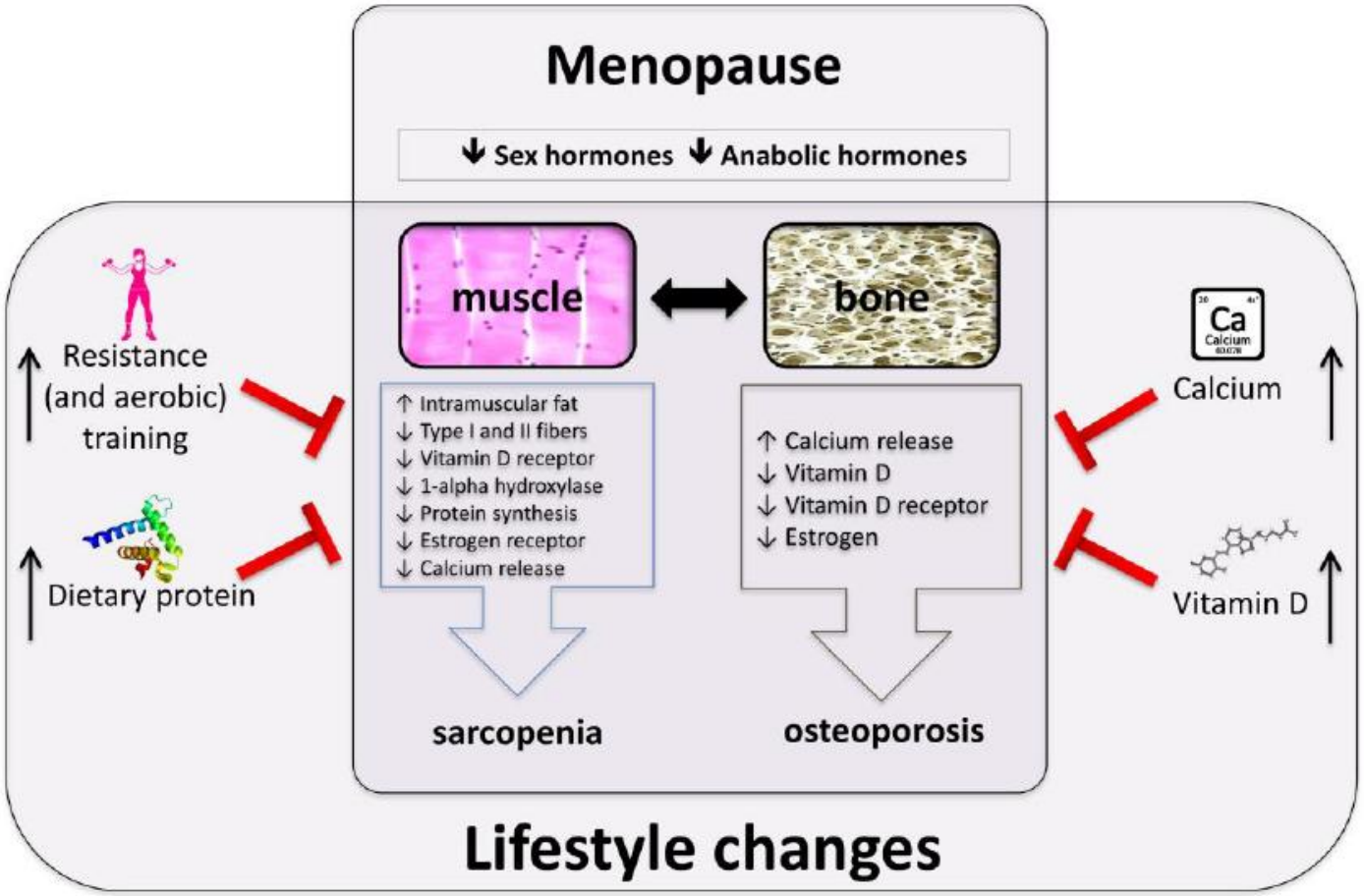


Figure 1. Menopause-related factors affecting muscle and bone and their possible prevention through a rationale strategy based on protein and vitamin D supplementation regimens in combination with specifically-designed training protocols.

WC

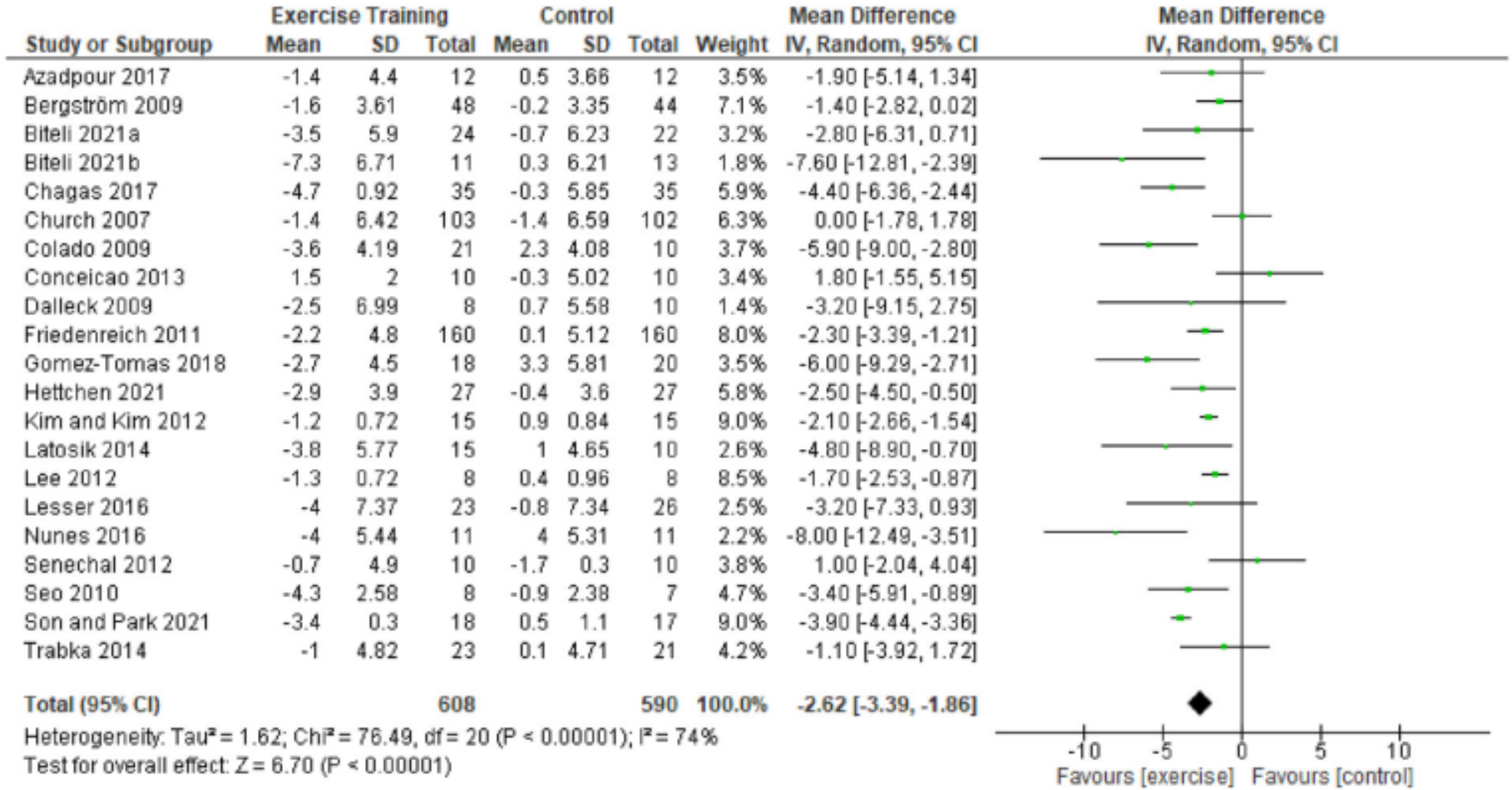
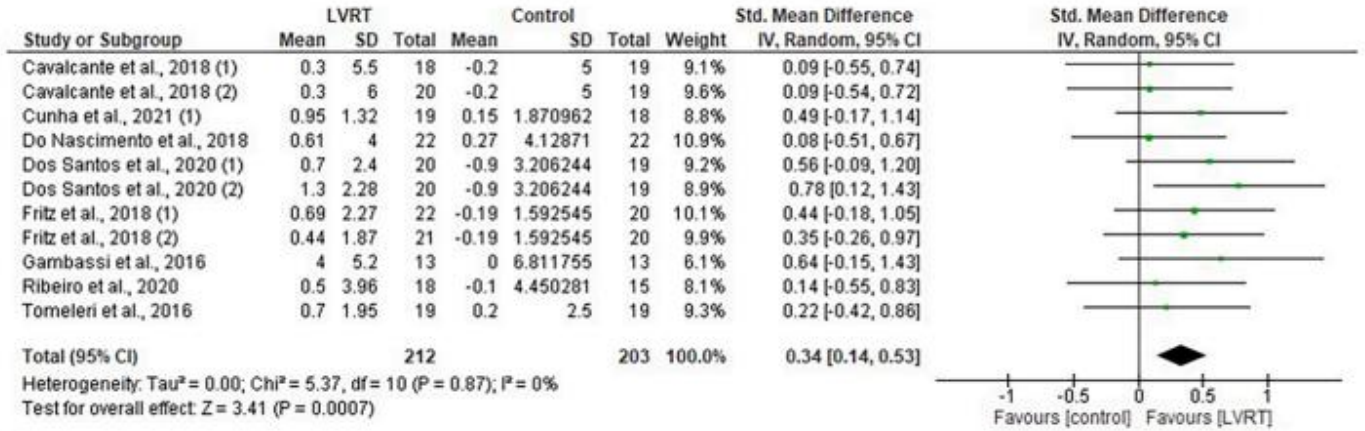
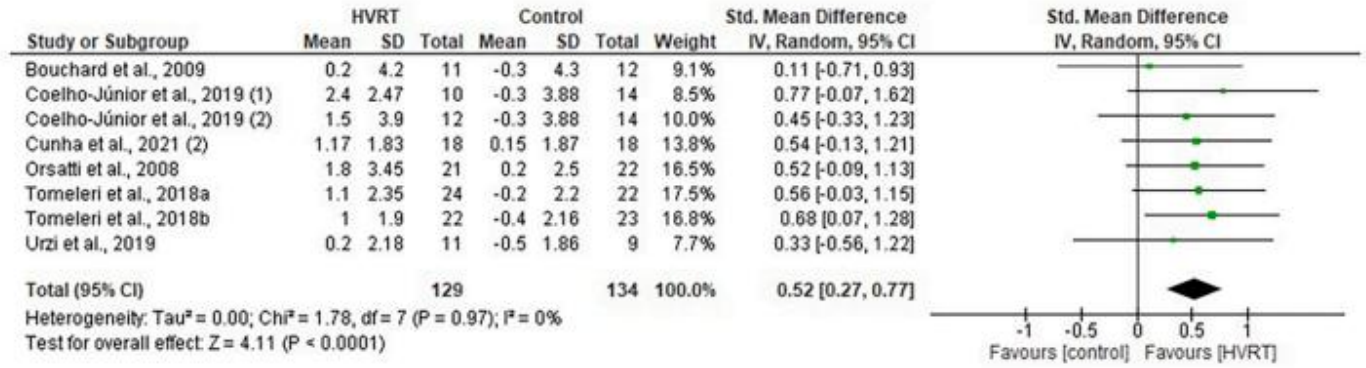


Fig. 2. Forest plot of randomised controls trials investigating the effect of exercise training vs control on waist circumference using the random effects model. There are a total of 21 studies reporting changes in waist circumference (cm). Negative values favour exercise intervention on the left side. 95% CI: 95% confidence interval; MD: mean difference; SD: standard deviation.

Muscle



A



B

Fig. 3. Forest plot of the effects of resistance training volume on muscle hypertrophy. A - Low volume resistance training (LVRT) vs Control and B - High volume resistance training (HVRT) vs Control.

Glucose

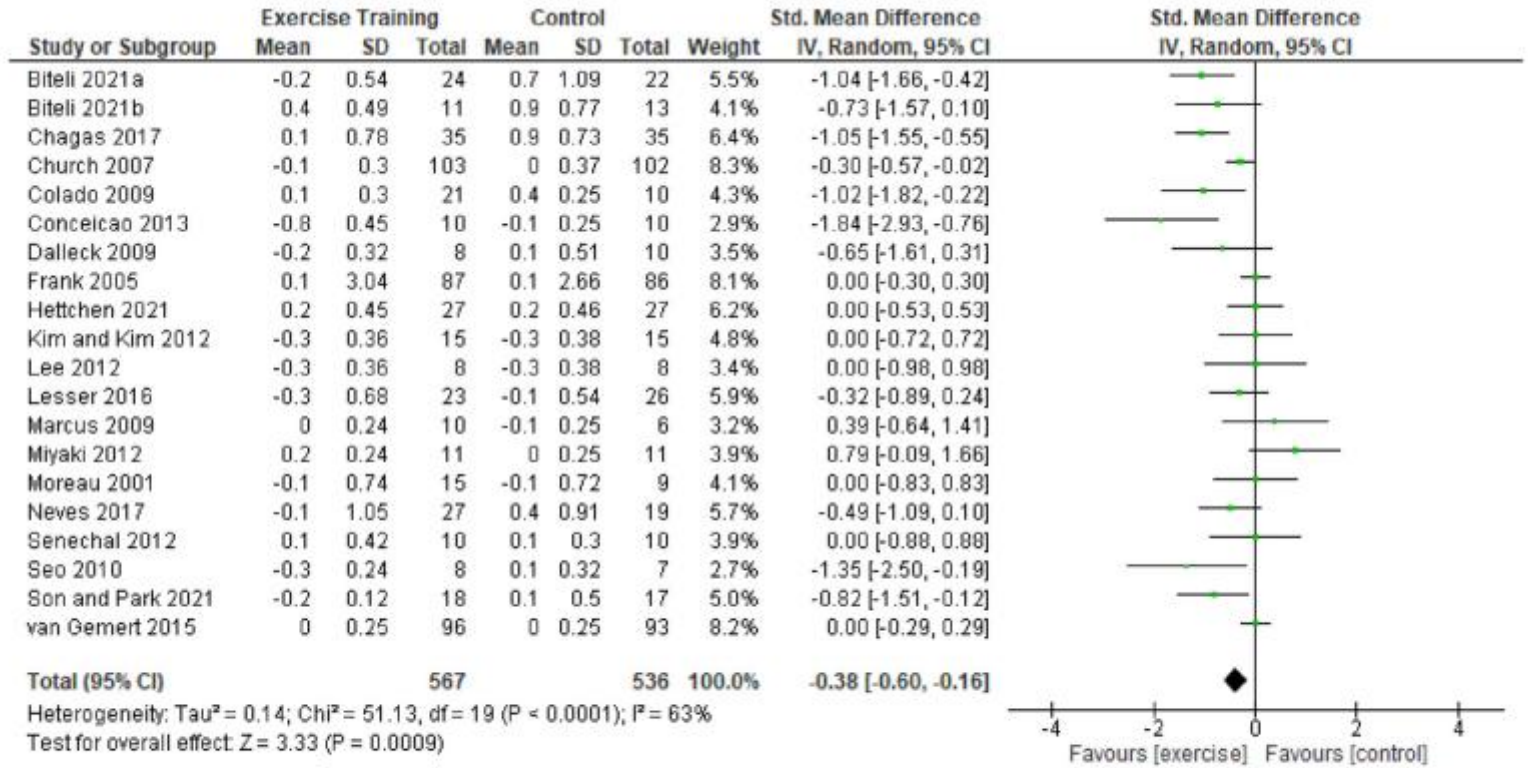
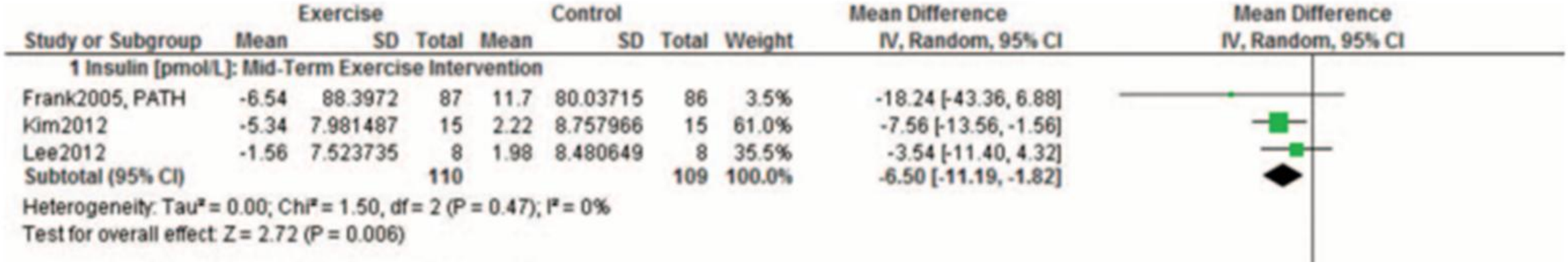
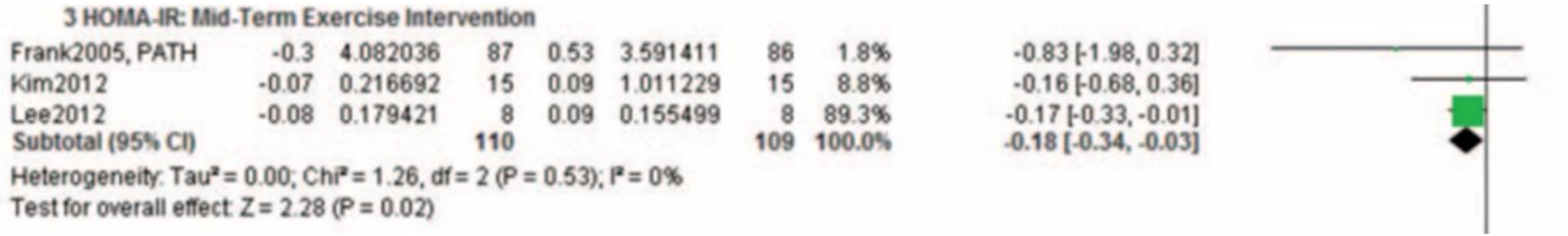


Fig. 5. Forest plot of randomised controls trials investigating the effect of exercise training vs control on blood glucose using the random effects model. There are a total of 20 studies reporting changes in glucose (mmol/L). Negative values favour exercise intervention on the left side. 95% CI: 95% confidence interval; SMD: standardised mean difference; SD: standard deviation.


Exercise
Control
Mean Difference
Mean Difference
Study or Subgroup Mean SD Total Mean SD Total Weight IV, Random, 95% CI
IV, Random, 95% CI
1 Insulin [pmol/L]: Mid-Term Exercise Intervention
Frank2005, PATH -6.54 88.3972 87 11.7 80.03715 86 3.5% -18.24 [-43.36, 6.88]
Kim2012 -5.34 7.981487 15 2.22 8.757966 15 61.0% -7.56 [-13.56, -1.56]
Lee2012 -1.56 7.523735 8 1.98 8.480649 8 35.5% -3.54 [-11.40, 4.32]
Subtotal (95% CI) 110 109 100.0% -6.50 [-11.19, -1.82]
Heterogeneity: Tau² = 0.00; Chi² = 1.50, df = 2 (P = 0.47); I² = 0%
Test for overall effect: Z = 2.72 (P = 0.006)


3 HOMA-IR: Mid-Term Exercise Intervention
Frank2005, PATH -0.3 4.082036 87 0.53 3.591411 86 1.8% -0.83 [-1.98, 0.32]
Kim2012 -0.07 0.216692 15 0.09 1.011229 15 8.8% -0.16 [-0.68, 0.36]
Lee2012 -0.08 0.179421 8 0.09 0.155499 8 89.3% -0.17 [-0.33, -0.01]
Subtotal (95% CI) 110 109 100.0% -0.18 [-0.34, -0.03]
Heterogeneity: Tau² = 0.00; Chi² = 1.26, df = 2 (P = 0.53); I² = 0%
Test for overall effect: Z = 2.28 (P = 0.02)

Timing hypothesis

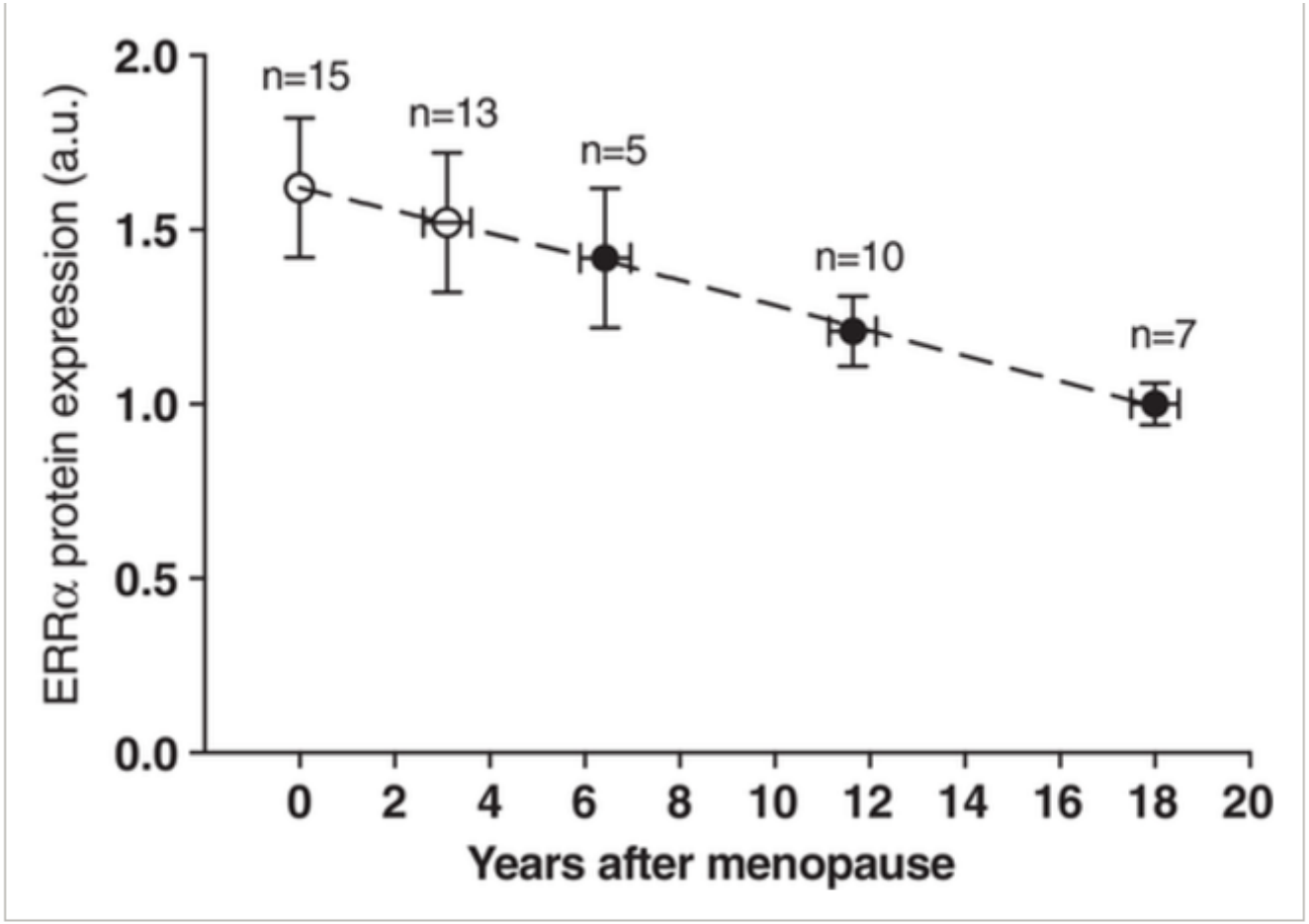
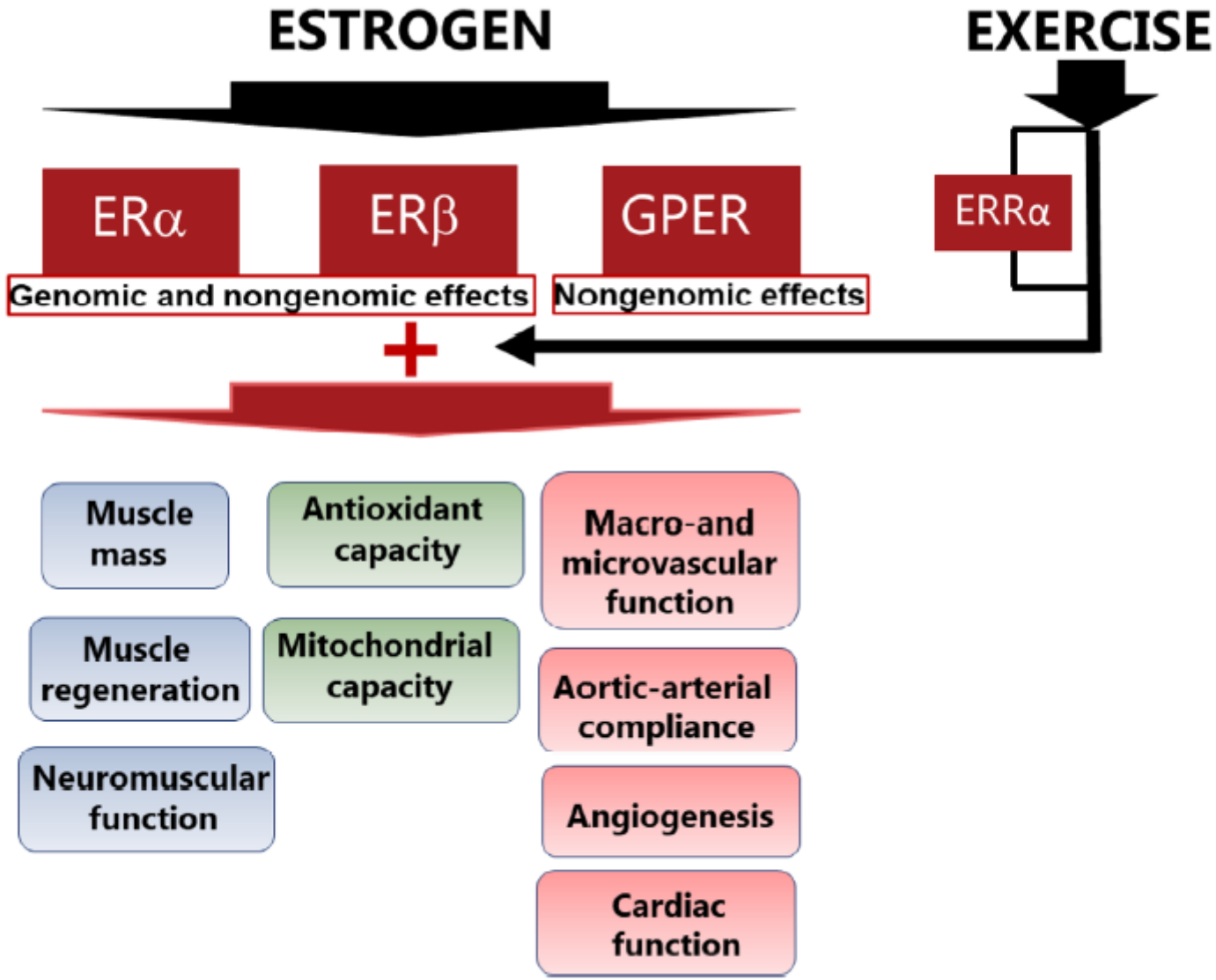


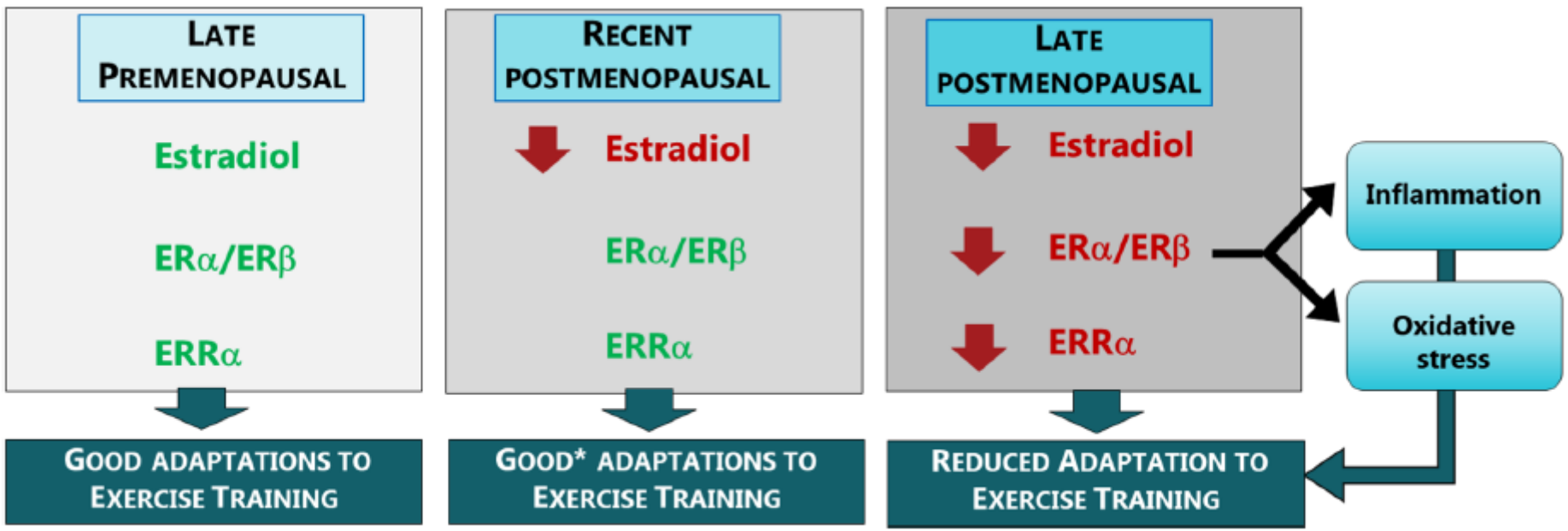
Figure 3. Protein expression of oestrogen-related receptor α (ERRα) as a function of time after menopause in skeletal muscle homogenates from sedentary pre- and postmenopausal women

Open in figure viewer | PowerPoint

Mette Hansen



Mette Hansen



Operate study

How does the combination of
hormone replacement therapy (HRT) + exercise
affect insulin sensitivity
compared to HRT alone or exercise alone?

Methods

In- and exclusion criteria

Diagnosis of menopause

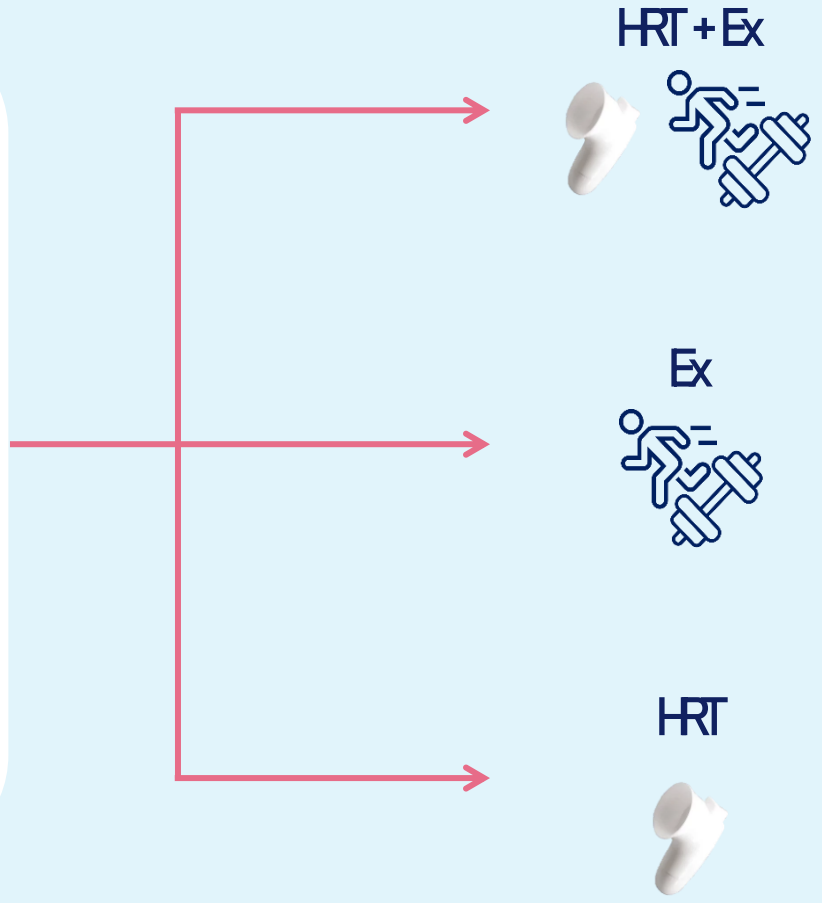
- Clinical: cessation of menses 12 months
- Blood analysis (FSH > 40IU/L, LH > 30IU/L, E_2 < 25pg/ml)

Age: 45 - 65 years

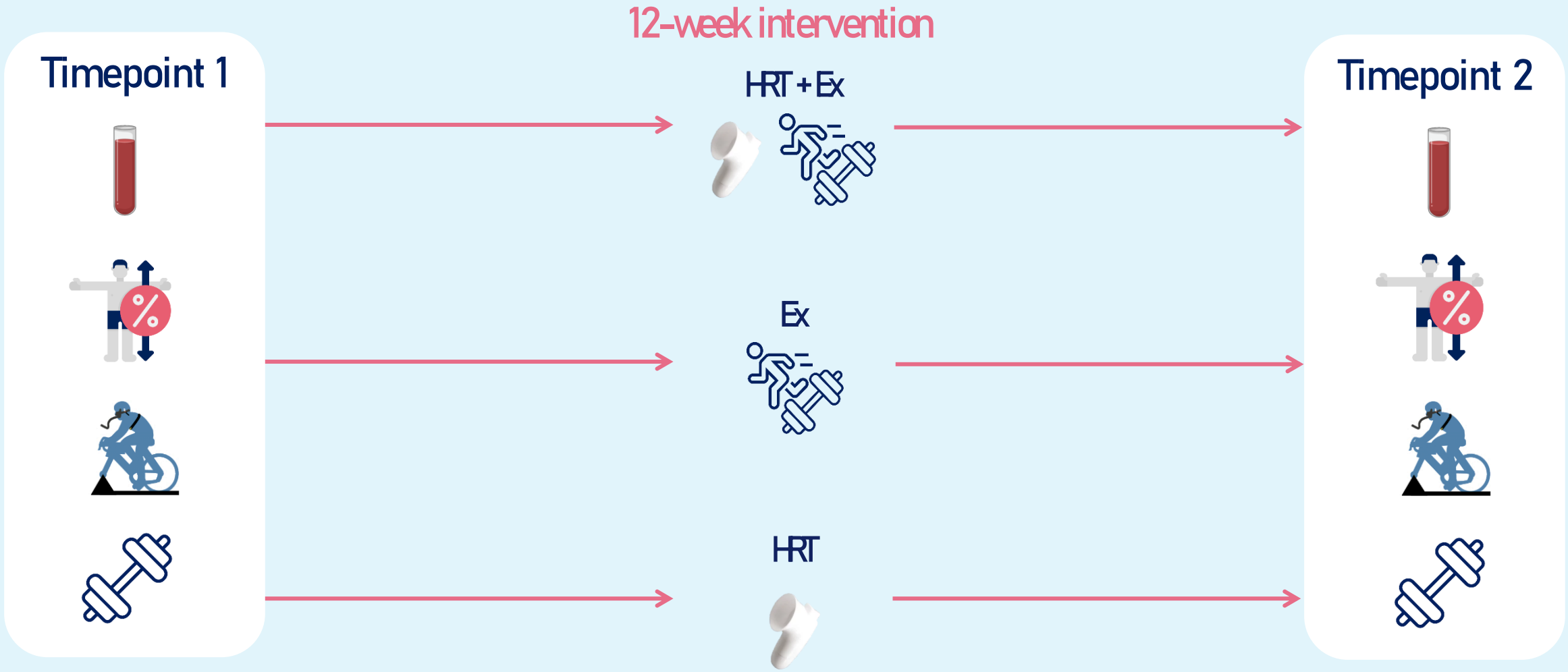
BMI: 20 - 30 kg/m²

No medication use except statins

No severe illnesses



Methods



Results

HRT + Ex

n = 18

Ex

n = 20

HRT

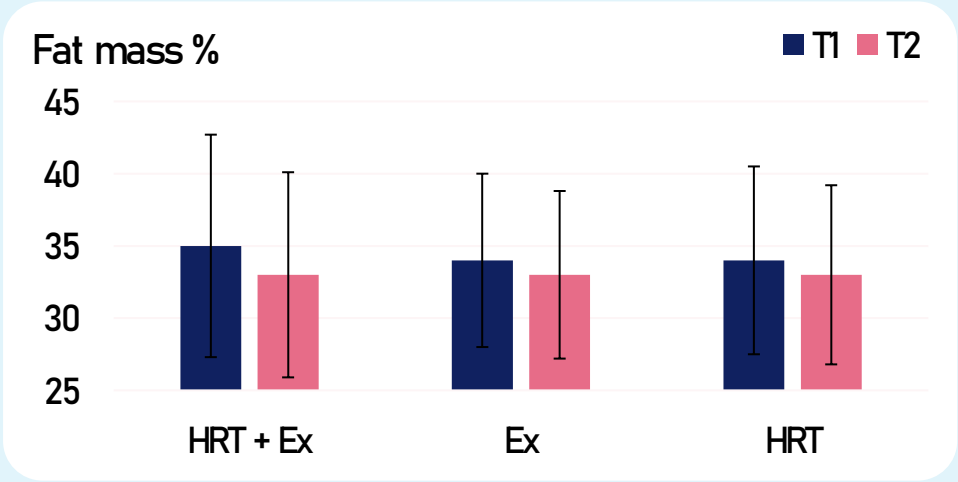
n = 18

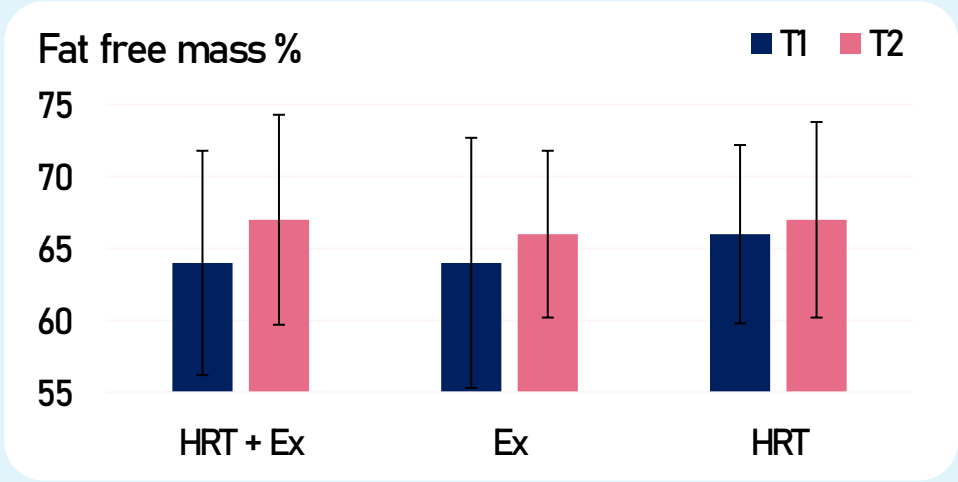
No significant differences in baseline characteristics between groups

	Age (years)	BMI (kg/m²)
N = 56	55 ± 3	27,6 ± 4,7

Results

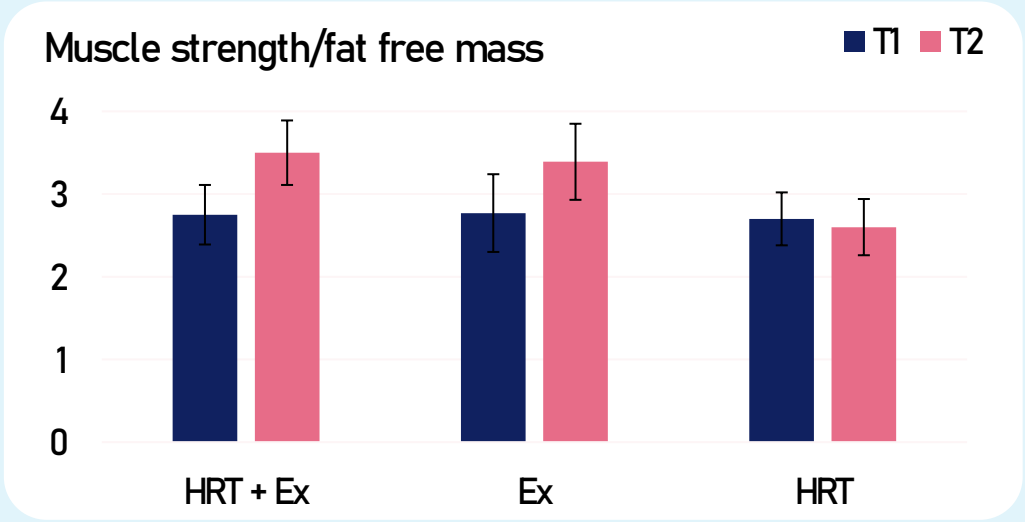
		HRT + Ex	Ex	HRT	Time effect	Group effect	Interaction effect Time*Group
Fat mass (%)	T1	35 ± 7,7	34 ± 6,0	34 ± 6,5	p<0,001	p=0,899	p=0,003
	T2	33 ± 7,1	33 ± 5,8	33 ± 6,2			
Fat free mass (%)	T1	64 ± 7,8	64 ± 8,7	66 ± 6,2	p<0,001	p=0,740	p=0,404
	T2	67 ± 7,3	66 ± 5,8	67 ± 6,8			
BMI (kg/m²)	T1	28,5 ± 5,7	27,6 ± 3,8	26,9 ± 4,6	p=0,958	p=0,707	p=0,515
	T2	28,2 ± 5,9	27,6 ± 3,8	27,2 ± 4,8			

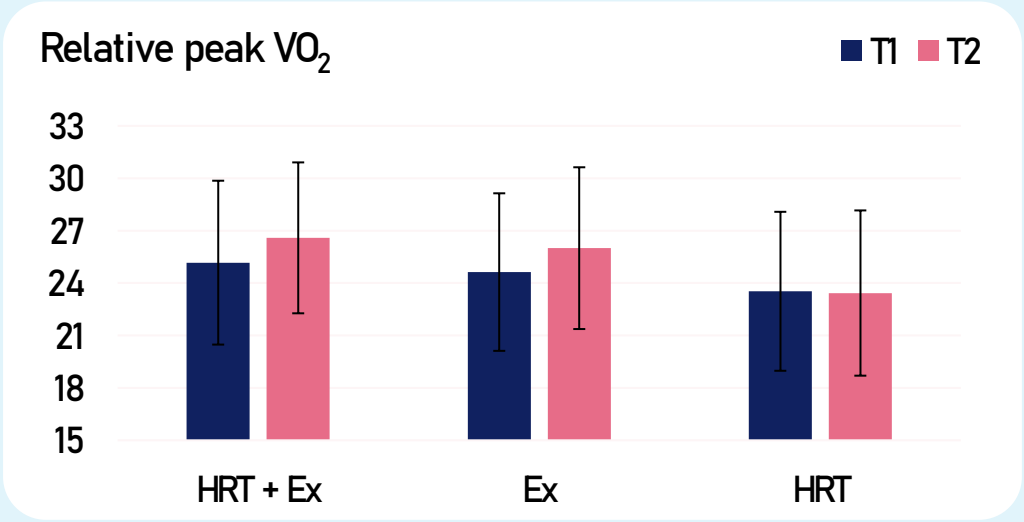




Results

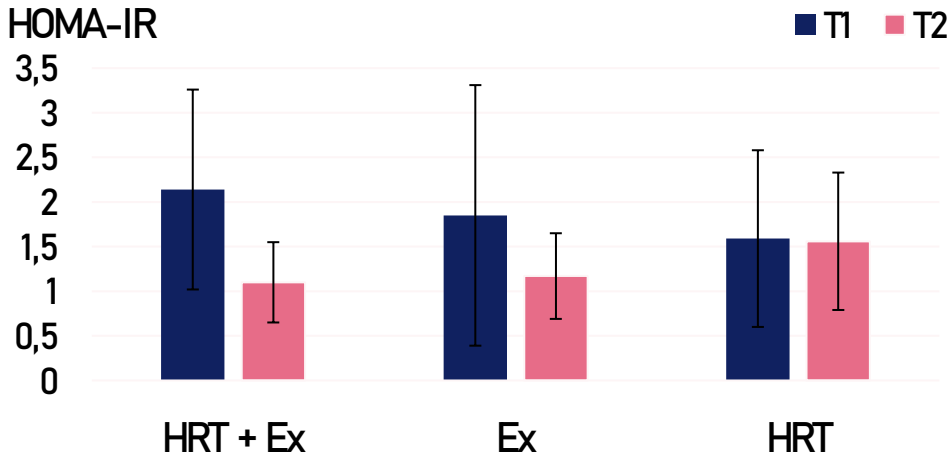
		HRT + Ex	Ex	HRT	Time effect	Group effect	Interaction effect Time*Group
Muscle strength/fat free mass	T1	2,8 ± 0,4	2,8 ± 0,5	2,7 ± 0,3	p<0,001	p<0,001	p<0,001
	T2	3,5 ± 0,4	3,4 ± 0,5	2,6 ± 0,3			
Relative peak VO_2	T1	25,17 ± 4,69	24,63 ± 4,51	23,53 ± 4,55	p=0,008	p=0,241	p=0,113
	T2	26,59 ± 4,32	26,00 ± 4,63	23,43 ± 4,73			





Results

		HRT + Ex	Ex	HRT	Time effect	Group effect	Interaction effect Time*Group
glucose (mg/dl)	T1	97 ± 16	92 ± 19	93 ± 6	p=0,041	p=0,382	p=0,758
	T2	92 ± 8	87 ± 9	92 ± 6			
Insulin (pmol/l)	T1	56 ± 26	53 ± 40	46 ± 25	p<0,001	p=0,899	p=0,047
	T2	31 ± 12	35 ± 17	46 ± 22			
HOMA-IR	T1	2,14 ± 1,12	1,85 ± 1,46	1,59 ± 0,99	p<0,001	p=0,920	p=0,046
	T2	1,10 ± 0,45	1,17 ± 0,48	1,56 ± 0,77			



For Δ HOMA-IR

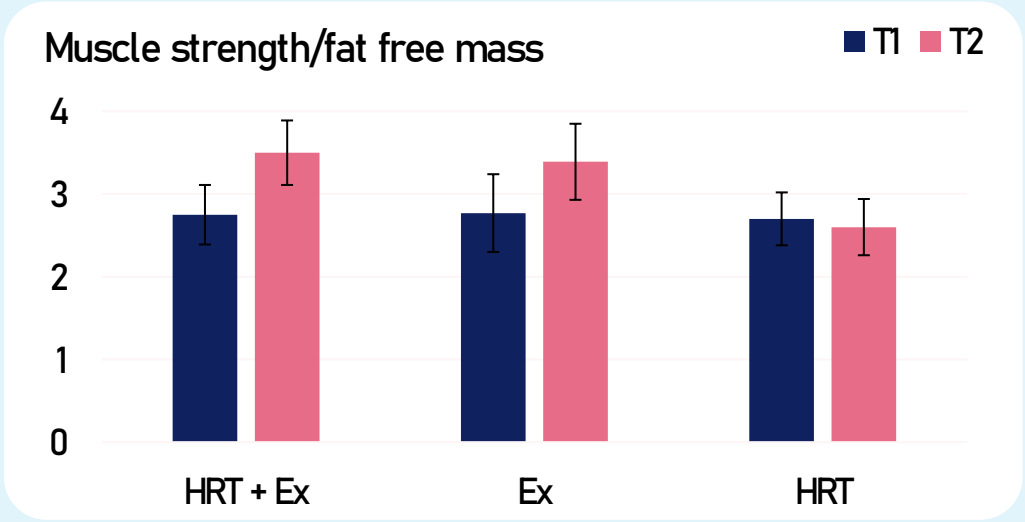
HRT + Ex vs. Ex: p=0,674

HRT + Ex vs. HRT: **p=0,042**

Ex vs. HRT: p=0,298

Results

		HRT + Ex	Ex	HRT	Time effect	Group effect	Interaction effect Time*Group
Muscle strength/fat free mass	T1	2,8 ± 0,4	2,8 ± 0,5	2,7 ± 0,3	p<0,001	p<0,001	p<0,001
	T2	3,5 ± 0,4	3,4 ± 0,5	2,6 ± 0,3			
Relative peak VO_2	T1	25,17 ± 4,69	24,63 ± 4,51	23,53 ± 4,55	p=0,008	p=0,241	p=0,113
	T2	26,59 ± 4,32	26,00 ± 4,63	23,43 ± 4,73			

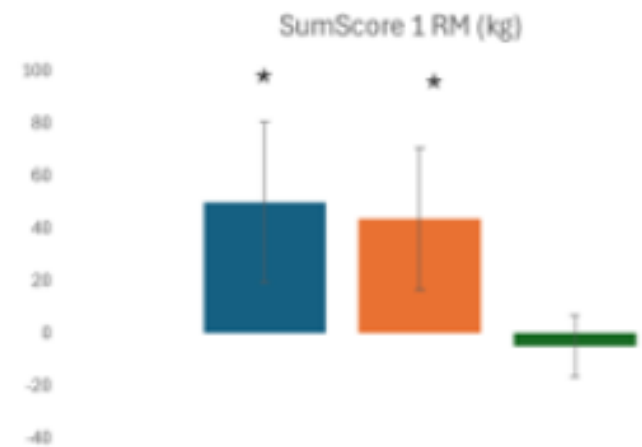


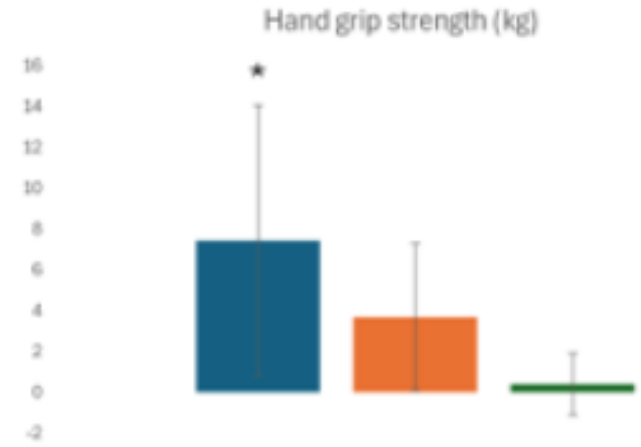
For Δ muscle strength/fat free mass

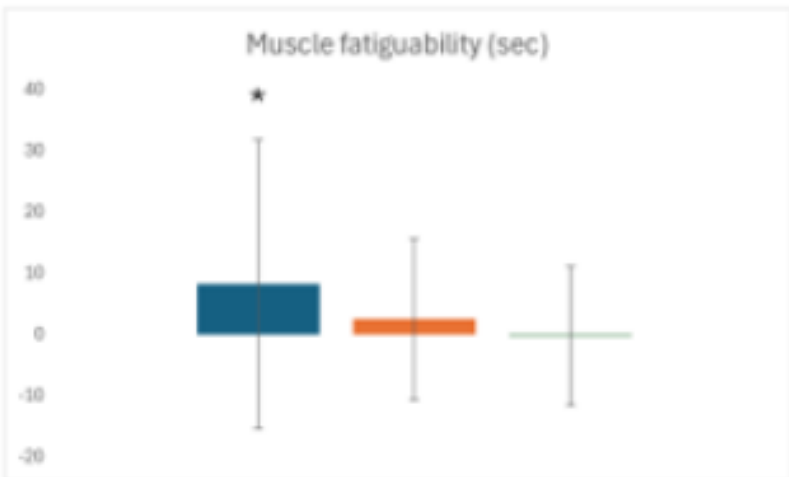
HRT + Ex vs. Ex: p=0,722

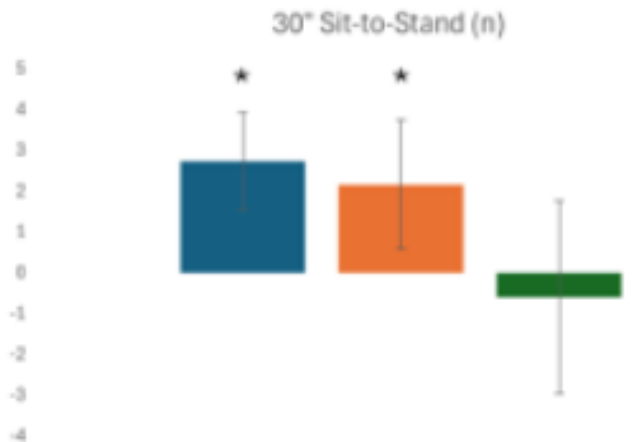
HRT + Ex vs. HRT: **p<0,001**

Ex vs. HRT: **p<0,001**


SumScore 1 RM (kg)
100
80
60
40
20
0
-20
-40


Hand grip strength (kg)
16
14
12
10
8
6
4
2
0
-2


Muscle fatiguability (sec)
40
30
20
10
0
-10
-20

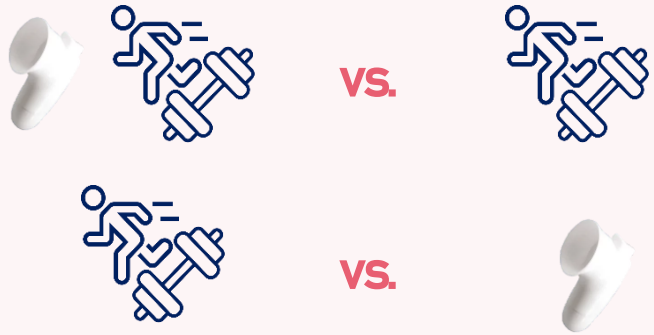

30" Sit-to-Stand (n)
5
4
3
2
1
0
-1
-2
-3
-4

Conclusion

1

HRT+Ex significantly improved insulin sensitivity and fat mass % compared to only HRT following a 12-week intervention.

2



There were no significant differences in the effect of

- HRT+Ex compared to only Ex
- only Ex compared to only HRT

on insulin sensitivity and body composition.

Heyens Isabelle – diëtiste/projectmedewerker nutritie
Centrum voor gezonde voeding en diëtiek

Gezonde voeding als ondersteuning tijdens de menopauze

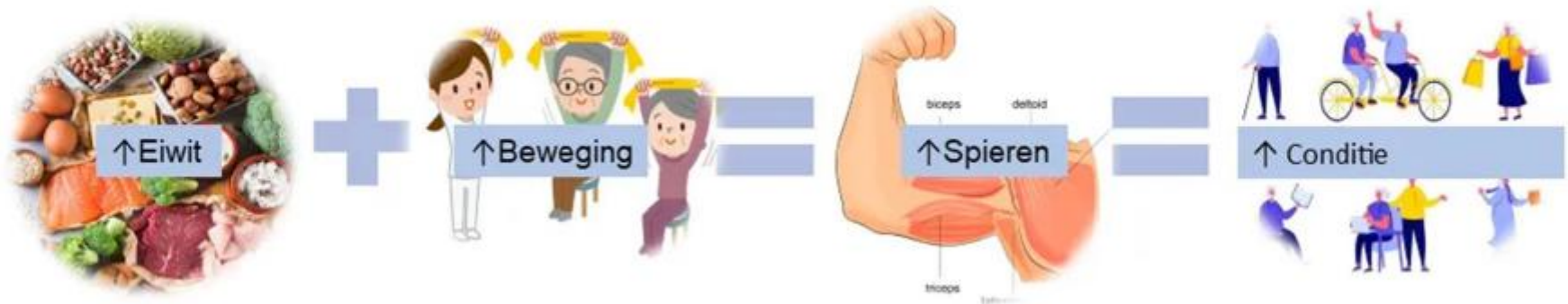
VOEDINGSDRIEHOEK

VLAAMS INSTITUUT GEZOND LEVEN

gezondleven.be

Eiwitten

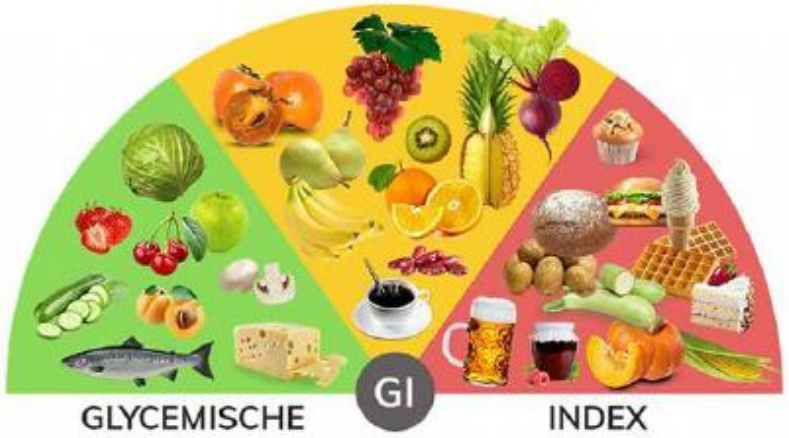
- Eiwitten verdelen over de dag: ideaal is 20 – 30 gram eiwitten per maaltijd
- Tip: “zorg dat elke maaltijd een eiwitbron bevat – inclusief het ontbijt”



Koolhydraten en vezels

- **Insulineresistentie** aanpakken via voeding: (combo voeding/beweging/eventueel medicatie)
  - Combineer complexe KH met vezels, eiwitten en gezonde vetten = **lagere glycemische index**

- **Voorbeelden van lage GI-voeding**
  - **Volkorenproducten**: volkoren pasta, zilvervliesrijst, havermout,…
  - **Peulvruchten**: linzen, kikkererwten, bruine bonen,kidneybonen,…
  - **Groenten**: broccoli, courgette, paprika, …
  - **Fruit (matig)**: appel, peer, bessen,…
  - **Noten en zaden**.

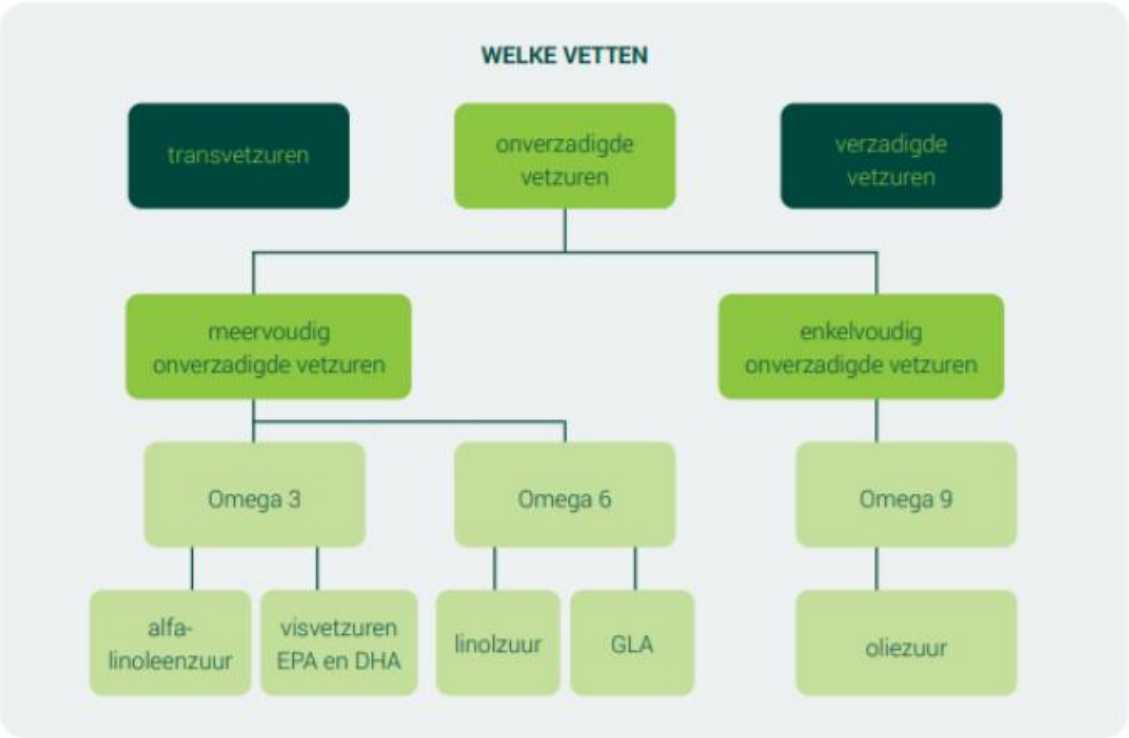


Vetten

- Menopauze verhoogt het cardiovasculair risico door o.a. toename van het visceraal vet, verhoging LDL (andere risicofactoren: roken, sedentair gedrag, gewichtsproblemen, diabetes, …)

- Kwaliteit boven kwantiteit (mediterraans dieet)

VERzadigde = VERkeerd
Onverzadigde = Oké



Figuur 2: soorten gezonde vetten

Calcium en vitamine D

- Oestrogeendaling = verhoogde botafbraak waardoor fractuurrisico stijgt op termijn
- Behoefte: 1000 – 1200 mg Ca/dag
- Bronnen van calcium: zuivel, calciumverrijkte plantaardige dranken, groene groenten, noten en sesam
- Vitamine D suppletie nodig? -> via huisarts huidige status te bepalen en al dan niet suppletie opstarten

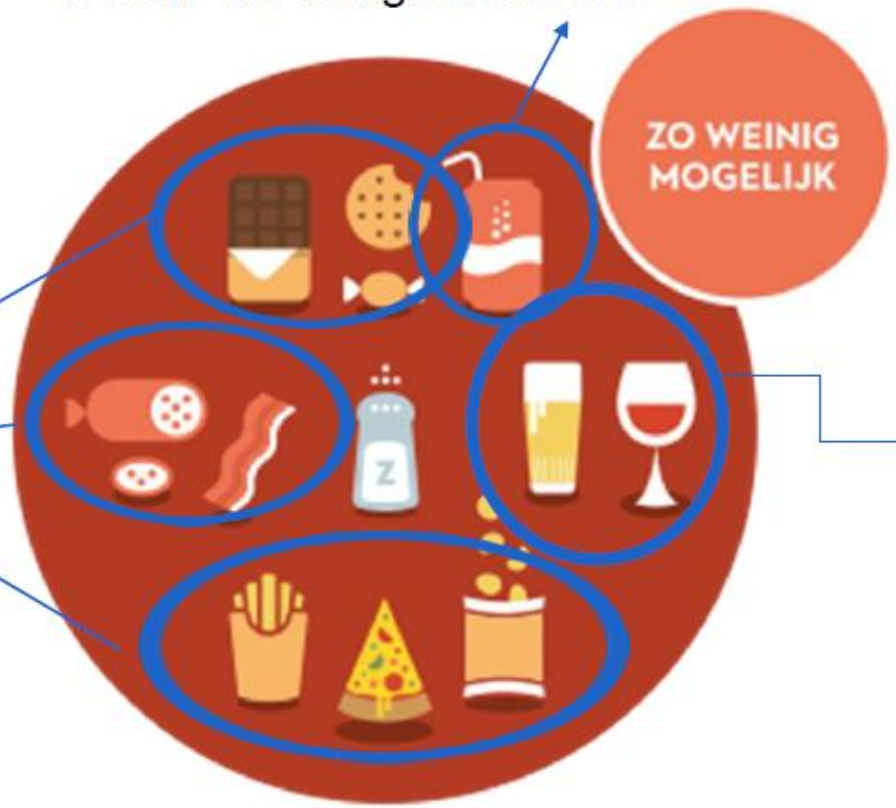
- Levensstijlaanpassingen:
  - Voldoende Ca en vitamine D inname
  - Alcohol beperken
  - Niet roken
  - Beweging
  - …

Hoge cafeïne-inname (> 400 mg/dag, >4 koppen koffie) kan:
- Opvliegers en nachtelijk zweten verergeren bij sommige vrouwen
- Slaap verstoren

Matige consumptie = geen negatieve effecten te hebben op botdichtheid of hart- en vaatgezondheid.

Ultrabewerkte voeding: veel zout, suiker, verzadigd vet, additieven en weinig vezels of micronutriënten.

- Gewichtstoename en viscerale vettoename → verhoogd risico op hart- en vaatziekten en DM2
- Negatieve impact op darmmicrobioom en ontstekingsniveau
- Vaak lage opname van calcium, magnesium en vitamine D → botgezondheid kan lijden



Overmatig alcoholgebruik kan:
- Botverlies versnellen
- Vasomotorische symptomen (opvliegers, nachtelijk zweten) verergeren
- Gewichtstoename bevorderen
- Verstoort de slaap
- …