

Osteoporose:

Diagnostik og forholdsregler ved
behandling og træning

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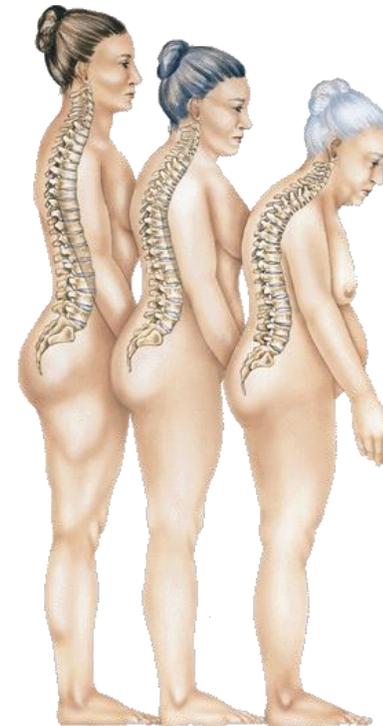
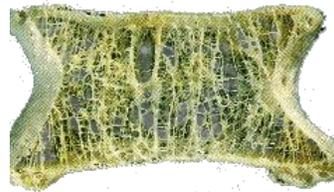


Definition af osteoporose



Definition 1:

Fraktur af **columna eller hofte**
opstået spontant eller efter
lavenergi traume



From: **Vertebral Fractures and Mortality in Older Women: A Prospective Study**

Arch Intern Med. 1999;159(11):1215-1220. doi:10.1001/archinte.159.11.1215

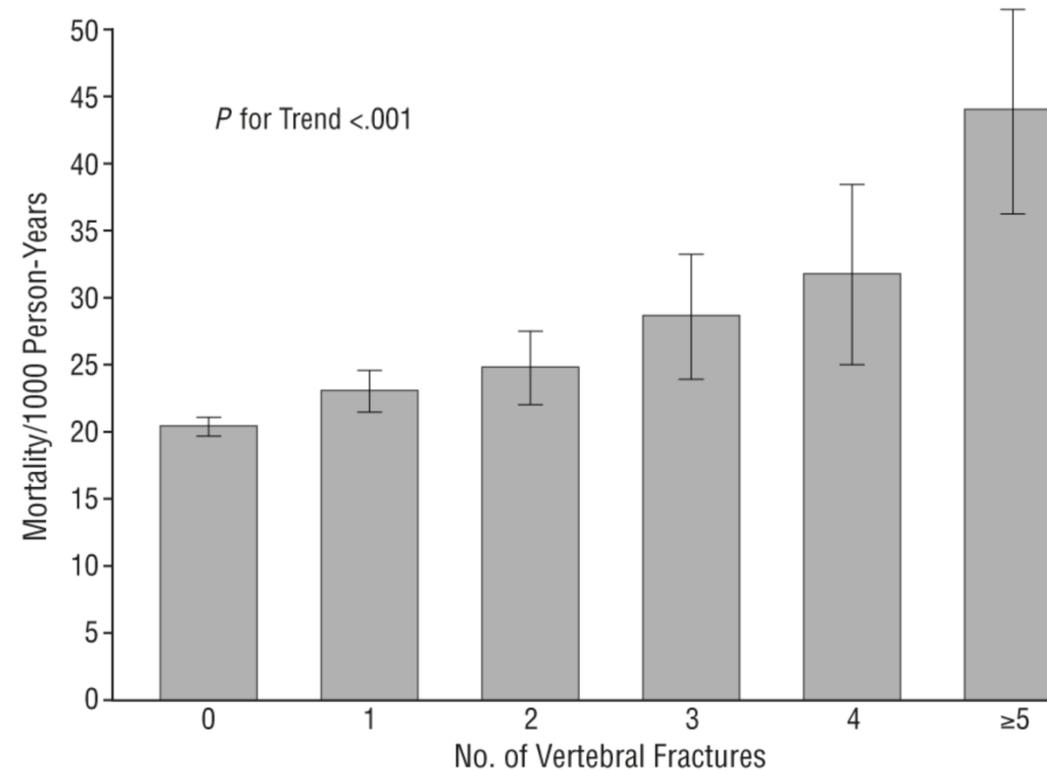


Figure Legend:

Age-standardized mortality by number of vertebral fractures.

Hoftefrakturer og mortalitet

Table 1. Demographics and comorbidities for patients born in 1945 or earlier with incident hip fracture in Denmark 1999–2002

	Women (N=30,755)	Men (N=11,321)	<i>P</i>
Age	81.7 ± 8.9	78.1 ± 10.0	<0.001
Mortality			
3 months	15.3%	23.9%	<0.001
12 months	26.4%	37.1%	<0.001
36 months	46.3%	57.1%	<0.001

Hoftefrakturer og mortalitet

Table 2 Cox regression analysis showing unadjusted and adjusted HR for mortality at time intervals after hip fracture

Time after fracture	HR (95% CI)	HR (95% CI) ^a
3 months	6.5 (4.2–9.6)	8.5 (4.6–15.6)
3–6 months	2.6 (1.6–4.2)	2.6 (1.4–4.7)
6–12 months	1.1 (0.7–1.7)	1.1 (0.7–1.9)
1–5 years	1.4 (1.1–1.8)	1.4 (1.1–1.9)
Entire period	1.9 (1.6–2.3)	2.0 (1.6–2.4)

^a Adjusted for BMI, smoking habits, hormone therapy and self-reported previous/current angina, myocardial infarction, stroke, diabetes, cancer

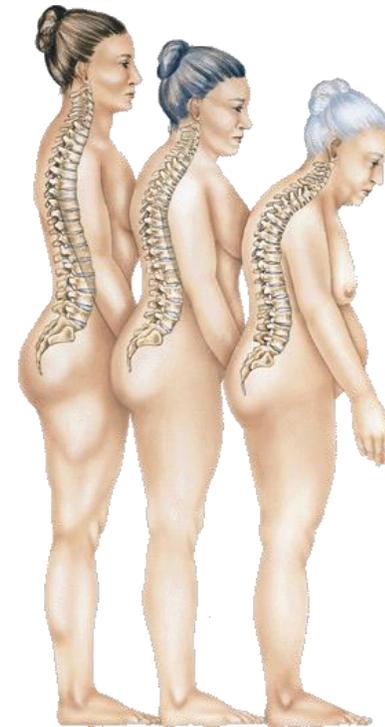
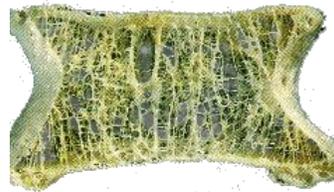


Definition af osteoporose



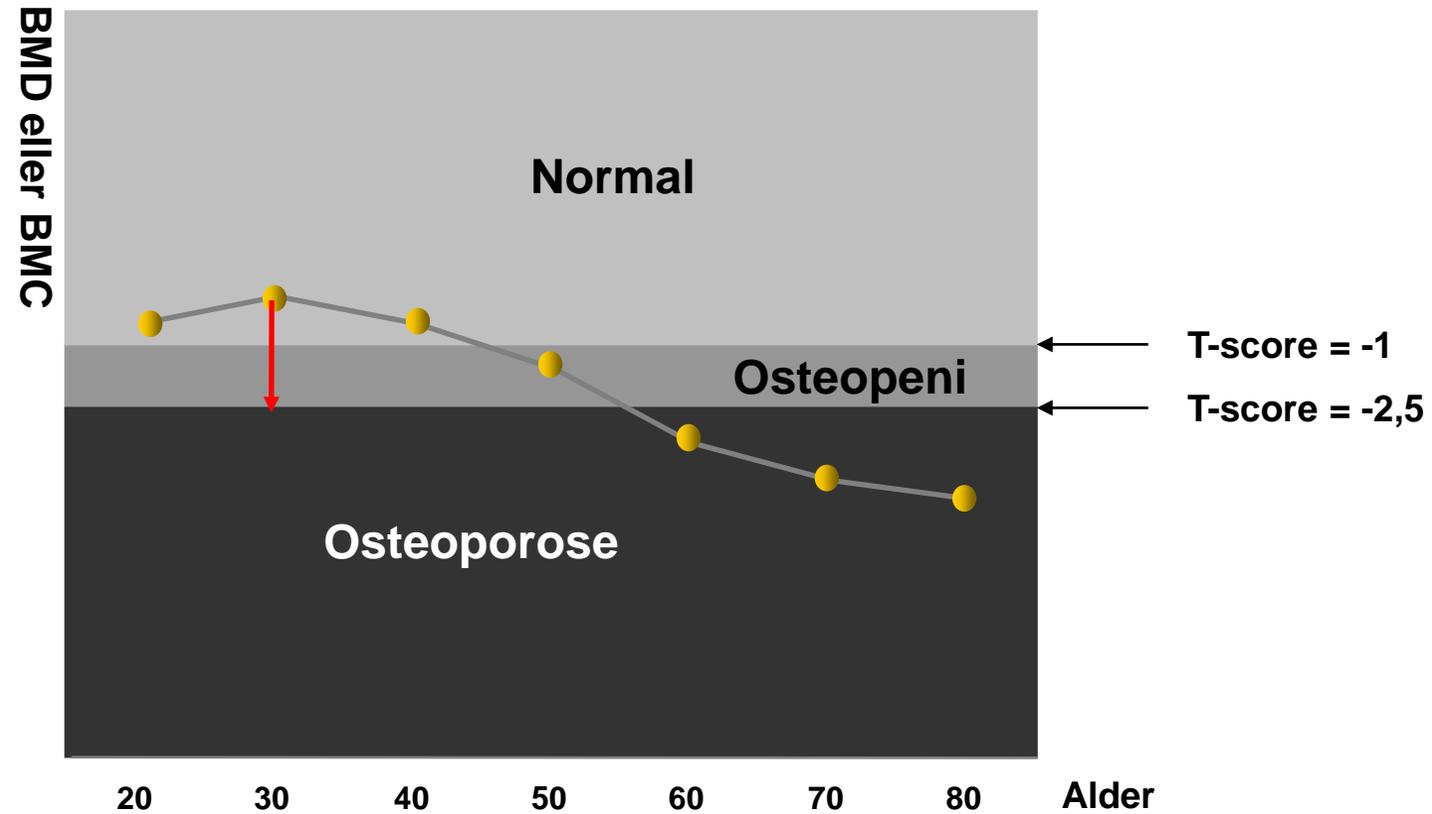
Definition 2:

**Svært nedsat BMD:
T-score i columna lumbalis eller
total hip ≤ -2.5**

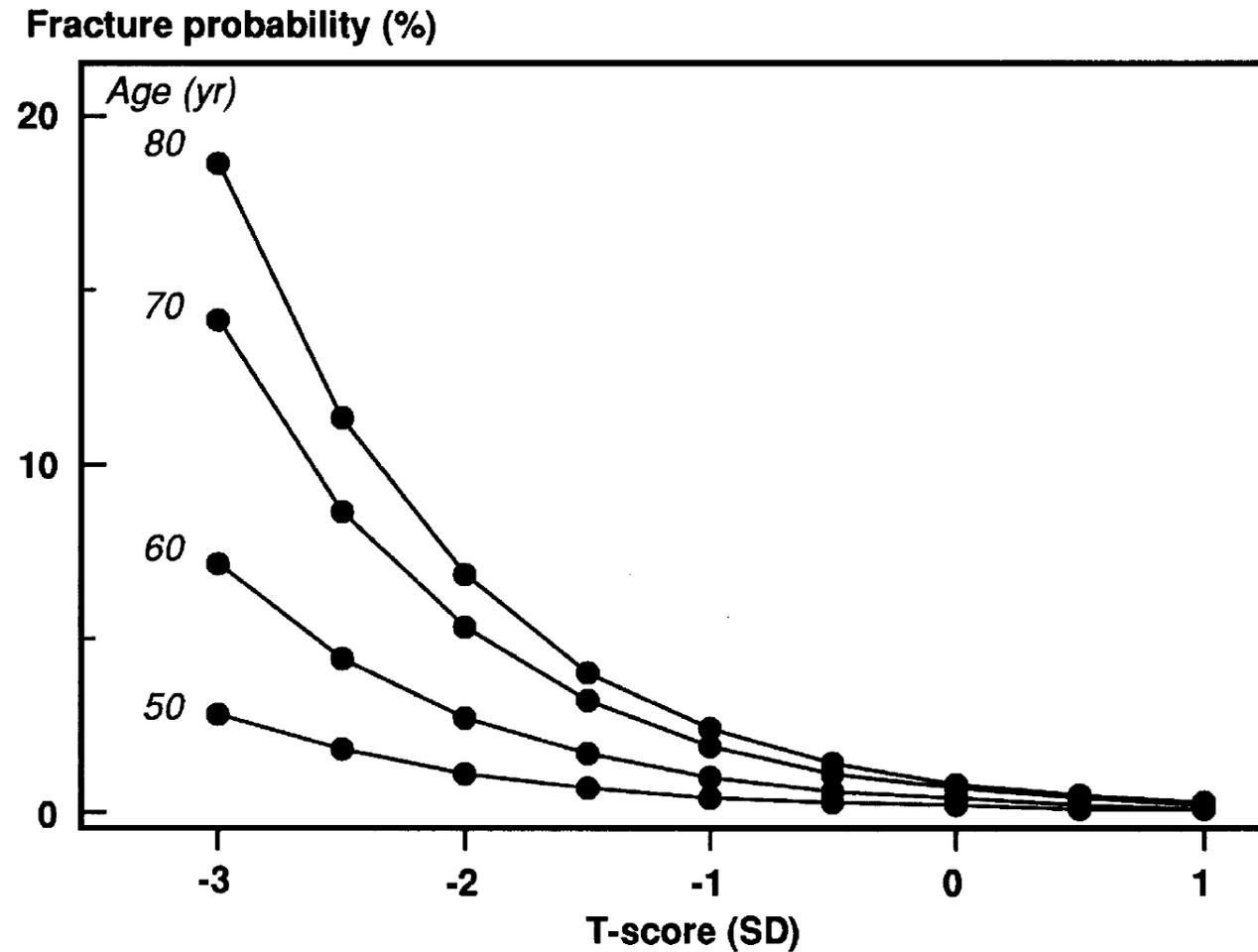




DXA undersøgelse af knoglevæv



Frakturrisiko og alder



Udredning

Osteoporoseudredning er i **udgangspunktet** relevant hos:

Postmenopausal kvinde eller mand > 50 år

OG

risikofaktor for knoglebrud

Årsager og risikofaktorer

- Tidligere lavenergifraktur
- Rygning
- Stort alkoholforbrug (>14/21 pr. uge)
- KOL (moderat/svær)
- Prednisolon
- Tidlig menopause
- Arvelig disposition

Medicinsk behandling

- **Antiresorptiv behandling**
 - **Bisfosfonater**
 - Perorale: alendronat, risedronat
 - Parenterale: zoledronsyre (ibandronsyre)
 - **Denosumab**
 - SERM: raloxifen
 - Østrogen eller testosteron
- **Anabol behandling**
 - Teriparatid (PTH 1-34)
- **Dual-action**
 - Romosozumab

Polyfarmaci


INFORMATION TIL SUNDHEDSFAGLIGE

Menu 

Indtast søgeord... 

A-Z søgning 

Interaktioner

Bisfosfonater bindes let til andre substanser, hvorfor absorptionsfraktionen nedsættes, hvis ventriklen ikke er helt tom på tidspunktet for indtag af tabletterne (se afsnit om dosering).

Graviditet

Må ikke anvendes.

Baggrund: Der er kun få ekspositionsdata, som dog ikke tyder på teratogene effekter. På grund af virkningsmekanisme og halveringstid frarådes brugen under graviditet.

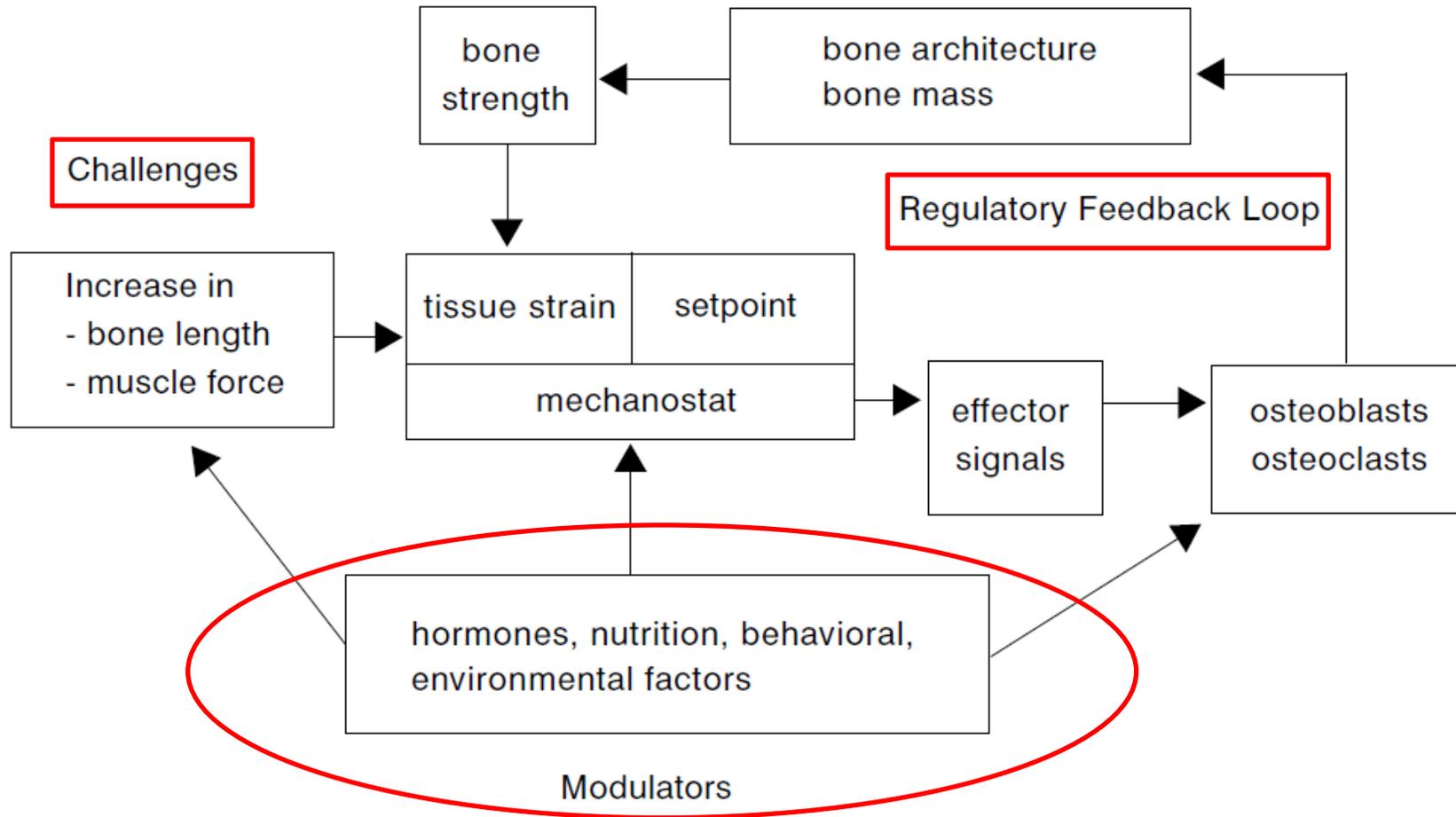
Se endvidere

[Klassifikation - graviditet](#)

- Ingen beskrevne interaktioner med Prolia
- Ingen kombinationsbehandling af osteoporose

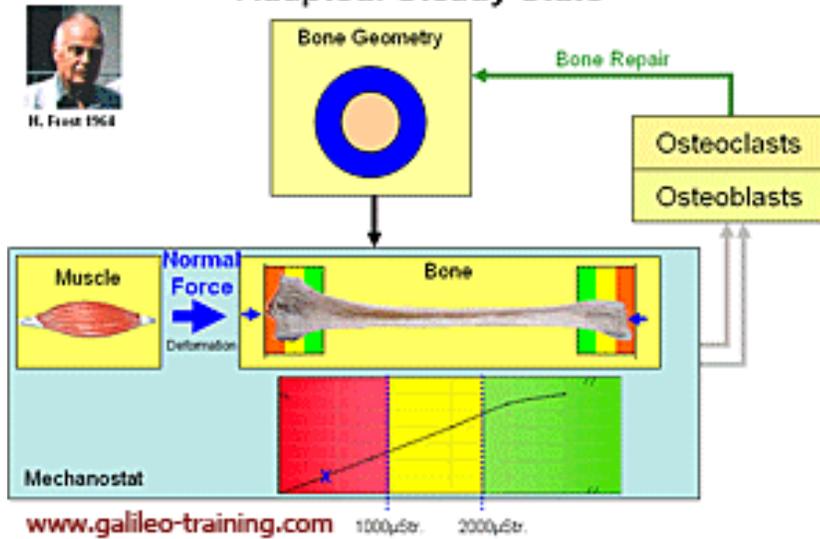
Motion og knogler

Mekanostaten

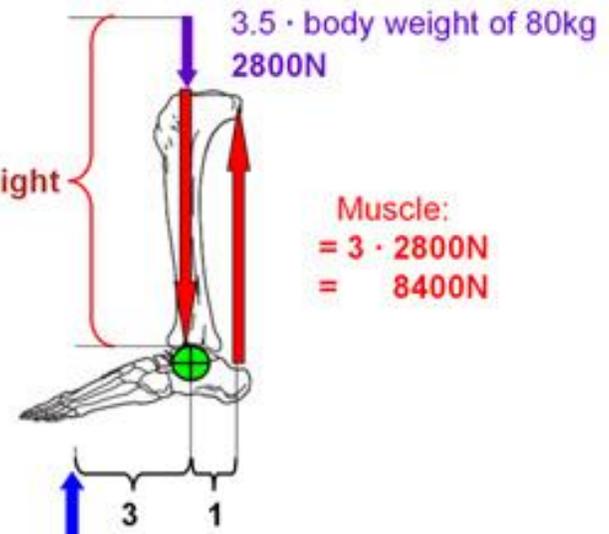


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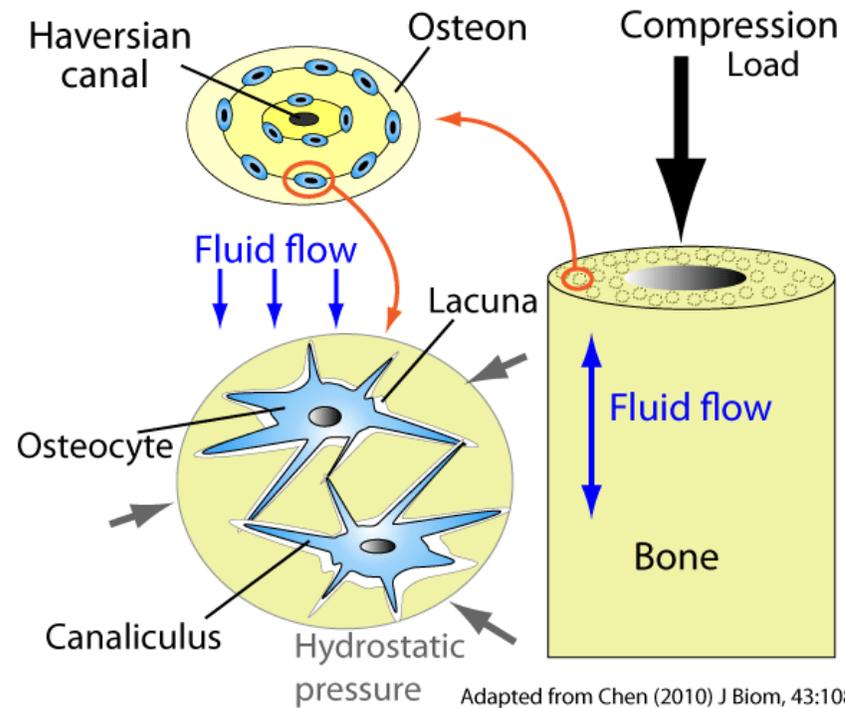
Mechanostat: control loop of bone adaptation
Adapted: Steady State



Force on Tibia:
 8400N
 $+ 2800\text{N}$
 $= 11200\text{N}$
 14 times body weight



$$F_{\text{Ground}} = 3.5 \cdot 800\text{N} = 2800\text{N (measurement)}$$



Vægtbærende træning!

Low Bone Mineral Density and Fragility Fractures in Permanent Vegetative State Patients

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Table 1. Characterization of Patients in Vegetative State

	All (N = 30)	Male (n = 16)	Female (n = 14)	<i>p</i> Value ^a
Age (years)	45 ± 14	43 ± 14	48 ± 14	0.32
BMI (kg/m ²)	21.5 ± 2.8	21.7 ± 2.8	21.3 ± 2.8	0.73
Duration of VS (years)	6.2 ± 5.1	6.0 ± 5.4	6.3 ± 4.9	0.89
<i>T</i> -score lumbar spine	-1.8 ± 1.5	-1.7 ± 1.9	-2.0 ± 0.9	0.54
<i>Z</i> -score lumbar spine ^b	-2.4 ± 1.1	-2.6 ± 1.2	-2.1 ± 0.9	0.36
BMD lumbar spine (g/cm ²)	0.870 ± 0.168	0.911 ± 0.202	0.821 ± 0.101	0.16
<i>T</i> -score total hip	-3.0 ± 1.4	-2.4 ± 1.3	-3.8 ± 1.1	0.0033
<i>Z</i> -score total hip ^b	-3.1 ± 1.1	-2.7 ± 0.8	-3.7 ± 1.2	0.06
BMD total hip, g/cm ²	0.581 ± 0.194	0.677 ± 0.197	0.478 ± 0.131	0.0036
Osteoporosis, <i>n</i> (%)	22 (73.3%)	10 (62.5%)	12 (85.7%)	0.26
Osteopenia, <i>n</i> (%)	6 (20.0%)	4 (25.0%)	2 (14.3%)	
Normal <i>T</i> -score, <i>n</i> (%)	2 (6.7%)	2 (12.5%)	0 (0.0%)	



ELSEVIER

Bone 33 (2003) 533–539

BONE

www.elsevier.com/locate/bone

Bone response to jumping is site-specific in children: a randomized trial☆

Neil Johannsen, Teresa Binkley, Virginia Englert, Greg Neiderauer, and Bonny

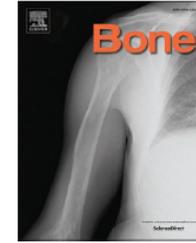
Ethel Austin Martin Program in Human Nutrition, South Dakota State University, Brookings, SD, USA

Received 5 February 2002; revised 20 June 2002; accepted 3 September 2002

- 12 ugers RCT
- 54 børn (alder 7-18)
- 25 hop/dag (45 cm), 5 dage /uge
- BMD ved DXA

Table 3
Absolute changes in bone parameters by DXA and pQCT for nonjumpers vs jumpers^a

	Nonjumpers	Jumpers
Height (cm)	1.4 ± 0.2	1.4 ± 0.9
Weight (kg)	1.1 ± 0.3	0.9 ± 0.2
TB and regional DXA	N = 26	N = 29
<u>Total body BMC (g)</u>	<u>29.4 ± 5.3^b</u>	<u>45.0 ± 4.9^b</u>
Total body bone area (cm ²)	26.2 ± 5.4	30.8 ± 5.0
<u>Legs BMC (g)</u>	<u>11.5 ± 2.8^b</u>	<u>19.8 ± 2.6^b</u>
Legs bone area (cm ²)	15.8 ± 3.1	15.3 ± 2.8
Spine BMC (g) ^c	1.3 ± 0.2 ^c	1.3 ± 0.2 ^e
Spine Bone area (cm ²) ^c	1.16 ± 0.35	1.47 ± 0.32
Spine BMD (g/cm ²) ^c	0.009 ± 0.004	0.013 ± 0.004
Femoral neck BMC (g) ^d	0.05 ± 0.03	0.11 ± 0.03
Femoral neck bone area (cm ²) ^d	0.10 ± 0.03	0.03 ± 0.04
Femoral neck BMD (g/cm ²) ^d	0.001 ± 0.005	0.011 ± 0.005
20% distal tibia pQCT	N = 25	N = 27
Periosteal circumference (mm)	0.3 ± 0.2	0.4 ± 0.2
Endosteal circumference (mm)	0.1 ± 0.4	0.2 ± 0.4
Cortical area (mm ²)	2.1 ± 1.0	2.0 ± 1.0
4% distal tibia pQCT	N = 19	N = 20
Total BMD (mg/cm ³)	9.2 ± 2.1 ^e	4.6 ± 2.2 ^e
Total BMC (mg)	10.1 ± 2.1 ^e	6.1 ± 2.1 ^e
Total bone area (mm ²)	11.9 ± 5.3	0.5 ± 5.4



Review Article

The effect of exercise intensity on bone in postmenopausal women (part 2):

A meta-analysis

Melanie Kistler-Fischbacher^{a,1}^a Menzies Health Institute Queensland, Griffith Univ^b School of Allied Health Sciences, Griffith University^c The Bone Clinic, Brisbane, QLD, Australia

High intensity interventions

Author (Year) [Ref]	Design	Duration	E: n/N	E: Mean (SD)	C: n/N	C: Mean (SD)	Intervention	Outcomes	
Liu-Ambrose 2004 [41]	RCT	25 wks	E: 34/29 C: 34/31	E: 79.6 (2.1) C: 79.5 (3.2)			Recruited BP, HT users and non-users, stratified randomisation	Resistance training: 2 × 6–8 reps at 75–85% 1 RM, upper and lower body; 2 × 50 min/wk, sup: yes, cmpl: 85%	FN, TH
Marin-Cascales 2019 [58]	Quasi-RCT	24 wks	E: 25/13 C: 15/10	E: 58.0 (7.3) C: 62.4 (5.1)			None	Impact training plus walking: 4–6 × 10 vertical jumps, 30–60 min walking; 3/wk, sup: yes, cmpl: 95.8%	LS, FN
Uusi-Rasi 2003 [59]	RCT	12 mos	E: 41/37 ME: 41/38 MC: 41/38 C: 41/39	E: 53.3 (2.2) ME: 53.0 (2.8) MC: 54.2 (2.4) C: 53.2 (2.1)			Randomised to 5 mg alendronate daily or placebo	Impact training: aerobic jump or step program alternating weekly, GRF = 2.1–5.6 × BW; 3 × 60 min/wk, sup: yes, cmpl: 1.6 ± 0.9/wk	LS, FN
Watson 2018 [45]	RCT	8 mos	E: 40/40 ME: 9/9 MC: 10/10 C: 42/42	E: 64.8 (4.2) ME: 67.0 (5.9) MC: 66.4 (6.7) C: 64.9 (4.7)			Recruited BP, DMAB, HT users and non-users, stratified randomisation	Resistance and impact training; RT: 5 × 5 reps, upper and lower body; impact: 5 × 5 jumping chin-ups with stiff-legged landing; 2 × 30 min/wk; sup: yes; E cmpl: 91.6 ± 10.4%, ME cmpl: 92.2 ± 6.3%	LS, FN

Table 1
Eligibility criteria.

	Inclusion criteria
Study design	Randomised controlled trial
Population of interest	Healthy postmenopausal women
Intervention	Any exercise intervention or ≥6 months (24 weeks) duration
Comparison	Non-exercise control, low intensity exercise, sham exercise
Outcome measures	BMD at the lumbar spine, femoral neck or total hip determined by DXA; pre- and post-intervention or mean change data from baseline to follow up published or provided by authors.
Languages	English, German, French
Years considered	No limitations
Publication status	Published in print or electronically in peer-reviewed journals



Moderate intensity interventions

Basat 2013 [46]	RCT 6 mos	E: 14/12 C: 14/12	E: 55.6 (2.9) C: 56.2 (4.0)	None	Impact training: jump rope training, 50 jumps per session; 3/wk, sup: yes, cmpl: $\geq 60\%$	LS, FN
Bassey 1995 [65]	RCT 12 mos	E: NR/20 C: NR/24	E: 54 (4) C: 55 (3)	None	Impact training: 50 heel drops (7/wk), GRF = $2.73 \times \text{BW}$, skipping and jumping (1/wk), sup: semi, cmpl: $84 \pm 10\%$	FN
Bassey 1998 [52]	RCT 12 mos	E: NR/45 ME: NR/24 MC: NR/22 C: NR/32	E: 55.8 (3.3) ME: 53.7 (3.2) MC: 53.4 (4.5) C: 54.9 (4.1)	Recruited HT users and non-users, randomisation not stratified, subgroup analyses performed	Impact training: 5×10 vertical jumps GRF = $3.96 \times \text{BW}$; 6×10 min/wk, sup: semi, cmpl: $91 \pm 13\%$ (median \pm IQR)	LS, FN
Bebenek 2010 [66]	RCT 12 mos	E: 43/36 C: 42/30	E: 52.3 (2.3) C: 52.4 (2.7)	None	Resistance and impact training: aerobics (GRF = $1.5 \times \text{BW}$), dance and step exercises, isometric strength training 9–12 reps at 70–80% 1 RM, upper and lower body; 3×60 min/wk, sup: yes, cmpl: 65%	LS, FN
Bemben 2000 [53]	Quasi-RCT 6 mos	E: 13/10 C: 11/8	E: 50.5 (2.0) C: 52.3 (1.4)	None	Resistance training: 3×8 reps at 80% 1 RM, upper and lower body; 3×60 min/wk, sup: yes, cmpl: 93%	LS, FN,
Bocalini 2009 [68]	RCT 24 wks	E: 23/15 C: 12/10	Mean (SE) E: 69 (9) C: 67 (8)	None	Resistance training: 3×10 reps, upper and lower body; 3×60 min/wk, sup: yes, cmpl: $\geq 90\%$	LS, FN
Bocalini 2010 [67]	RCT 24 wks	E: NR/13 C: NR/12	E: 66 (9) C: 64 (8)	None	Resistance training: 3×10 –12 reps at 60–70% 1 RM, upper and lower body; 3×60 min/wk, sup: yes, cmpl: $\geq 90\%$	LS
Bolton 2012 [47]	RCT 12 mos	E: 19/19 C: 20/18	E: 60.3 (5.6) C: 56.3 (4.7)	None	Resistance and impact training: 2×8 reps at 8 RM, daily jumps (3×10) at home; 3×60 min/wk, sup: semi, cmpl: $88 \pm 13\%$	LS, TH

Maddalozzo 2007	0.002	0.064	29	-0.042	0.059	29	1.1%	0.0440 [0.0123, 0.0757]
Marques 2011a	0.011	0.047	30	-0.005	0.038	30	1.9%	0.0160 [-0.0056, 0.0376]
Montgomery 2020; E1	-0.022	0.039	9	-0.019	0.025	11	1.2%	-0.0030 [-0.0325, 0.0265]
Montgomery 2020; E2	-0.019	0.044	8	-0.019	0.025	11	1.0%	0.0000 [-0.0339, 0.0339]
Murtezani 2017	0.049	0.048	31	0.006	0.044	30	1.8%	0.0430 [0.0199, 0.0661]
Nelson 1994	0.009	0.033	20	-0.019	0.035	19	2.0%	0.0280 [0.0066, 0.0494]
Newstead 2004	0.01	0.047	23	0.01	0.05	26	1.4%	0.0000 [-0.0272, 0.0272]
Nichols 1995	-0.02	0.055	14	0.014	0.055	14	0.7%	-0.0340 [-0.0747, 0.0067]
Nicholson 2015	0.011	0.03	24	-0.023	0.05	26	1.8%	0.0340 [0.0113, 0.0567]
Rhodes 2000	0.03	0.086	20	0	0.083	18	0.4%	0.0300 [-0.0238, 0.0838]
Sen 2020	0.003	0.033	16	-0.006	0.02	18	2.3%	0.0090 [-0.0096, 0.0276]
Siegrist 2006	-0.008	0.049	20	-0.006	0.045	19	1.2%	-0.0020 [-0.0315, 0.0275]
Verschueren 2004	0.001	0.066	22	0.004	0.072	23	0.7%	-0.0030 [-0.0433, 0.0373]
Von Stengel 2011	0.019	0.031	47	0.004	0.028	48	3.6%	0.0150 [0.0031, 0.0269]
Young 2007; moderate	-0.011	0.043	12	0.005	0.05	10	0.8%	-0.0160 [-0.0554, 0.0234]
Subtotal (95% CI)			838			803	70.6%	0.0124 [0.0078, 0.0170]

Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 124.29$, $df = 31$ ($P < 0.00001$); $I^2 = 75\%$

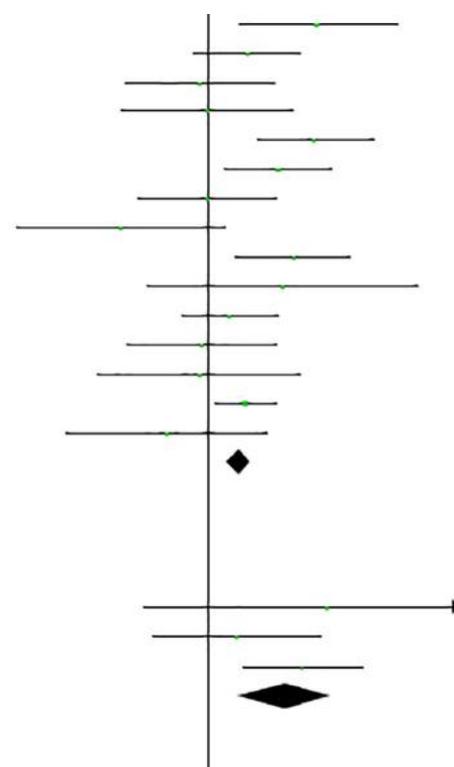
Test for overall effect: $Z = 5.31$ ($P < 0.00001$)

1.1.3 High intensity

Marin-Cascales 2019	0.03	0.088	13	-0.018	0.089	10	0.2%	0.0480 [-0.0250, 0.1210]
Uusi-Rasi 2003	0.011	0.066	37	-0.001	0.083	39	1.0%	0.0120 [-0.0216, 0.0456]
Watson 2018	0.022	0.038	40	-0.016	0.069	42	1.7%	0.0380 [0.0140, 0.0620]
Subtotal (95% CI)			90			91	2.9%	0.0305 [0.0116, 0.0493]

Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 1.76$, $df = 2$ ($P = 0.41$); $I^2 = 0\%$

Test for overall effect: $Z = 3.17$ ($P = 0.002$)



CLINICAL TRIAL

High-Intensity Resistance and Impact Training Improves Bone Mineral Density and Physical Function in Postmenopausal Women With Osteoporosis: The LIFTMOR Randomized Controlled Trial

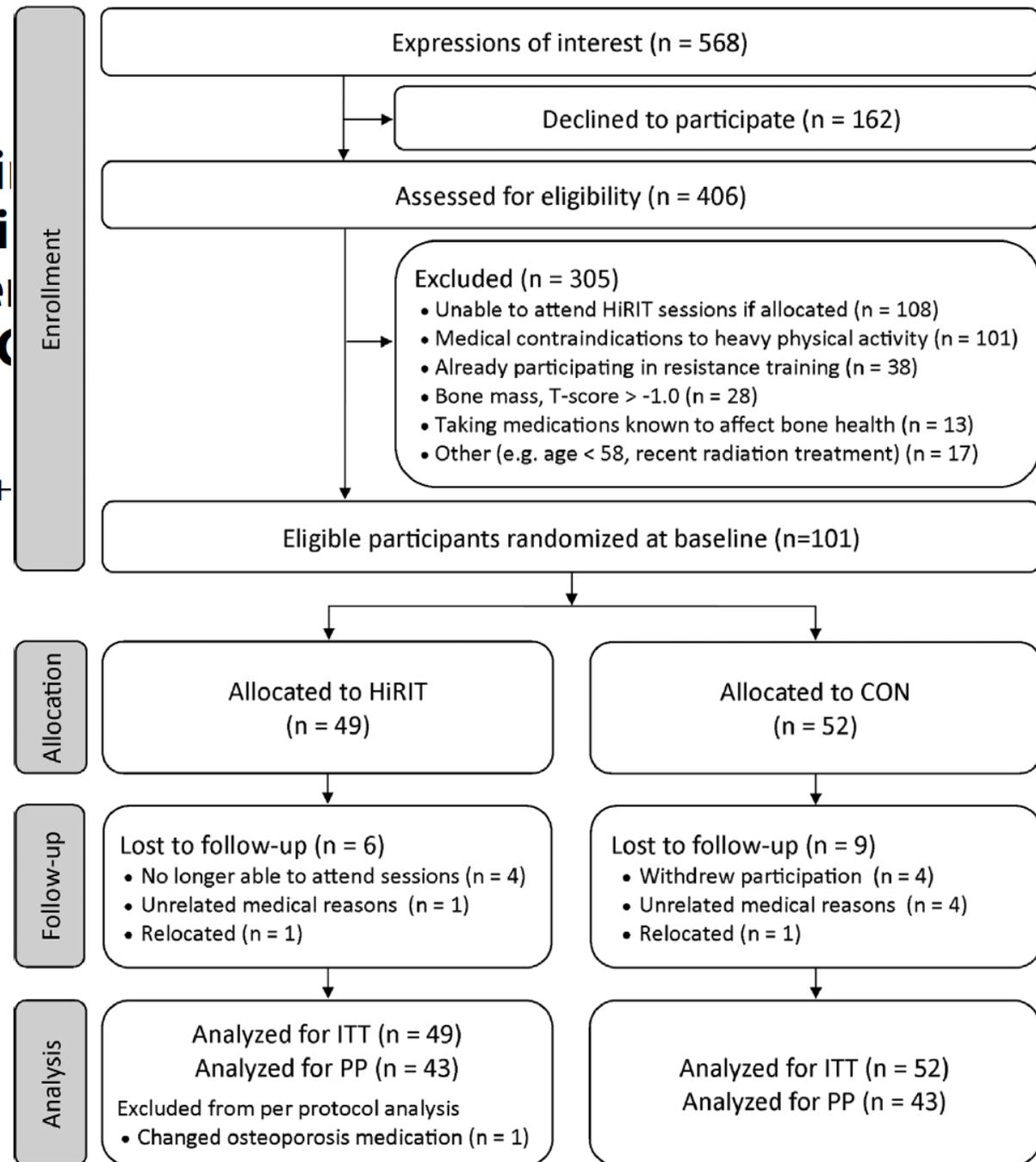
Steven L Watson,^{1,2} Benjamin K Weeks,^{1,2} Lisa J Weis,³ Amy T Harding,^{1,2} Sean A H and Belinda R Beck^{1,2,3}

¹School of Allied Health Sciences, Griffith University, Gold Coast, Queensland, Australia

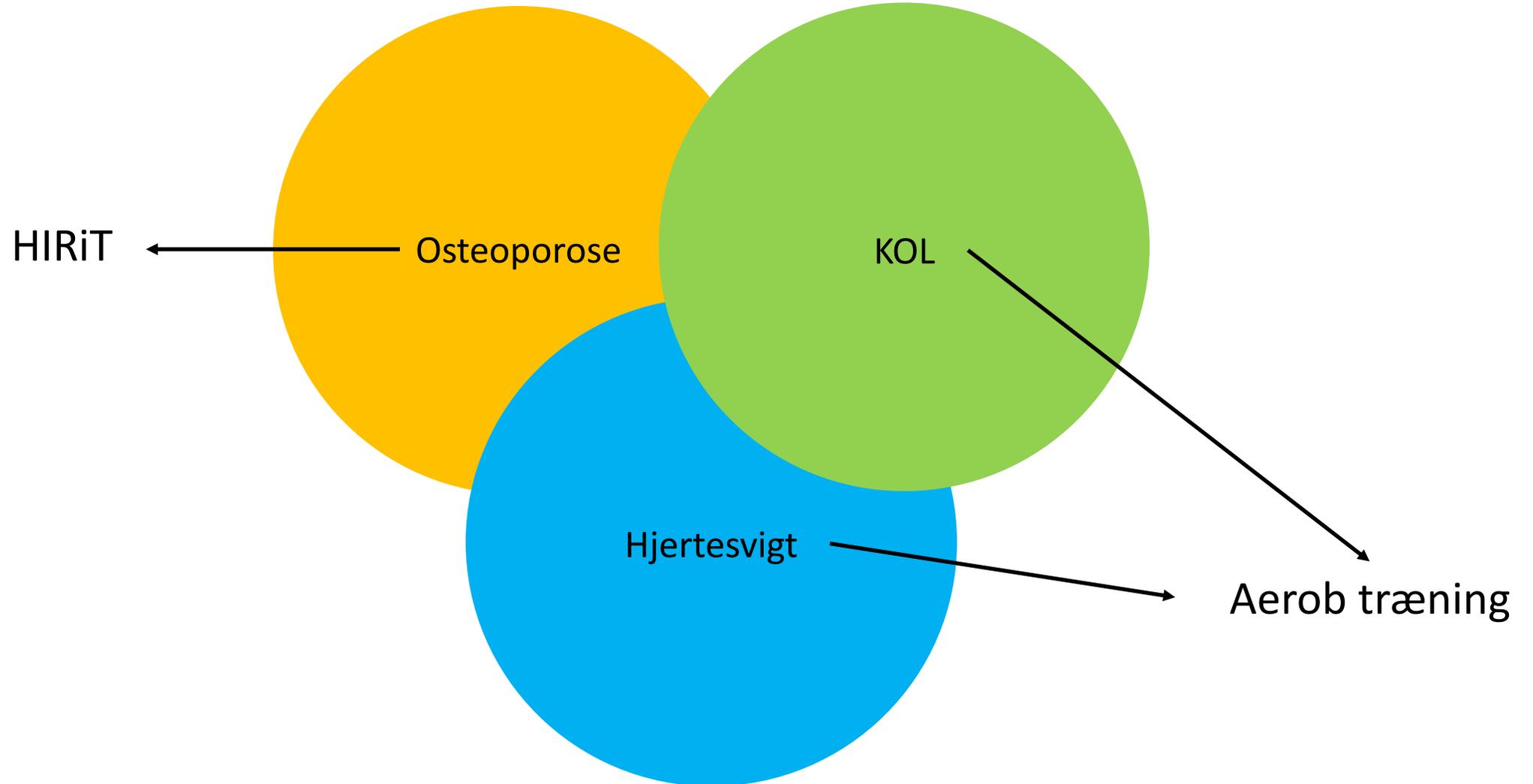
²Menzies Health Institute Queensland, Gold Coast, Queensland, Australia

³The Bone Clinic, Brisbane, Queensland, Australia

Langtidseffekter?
Hvad med frakturer??



Multimorbiditet



Exercise for preventing falls in older people (Review)

Sherrington C, Fairhall NJ, Wallbank GK, Tiedemann A, Hopewell S, Lamb SE

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)
	Assumed risk	Corresponding risk			
	Control	Exercise (all types)			
Rate of falls (falls per person-years)	All studies population		Rate ratio 0.77 (0.71 to 0.83)^d	12,981 (59 RCTs)	⊕⊕⊕⊕ high^e
	850 per 1000^c	655 per 1000 (604 to 706)			
Follow-up:					
Number of people who experienced one or more falls	All studies population		RR 0.85 (0.81 to 0.89)^g	13,518 (63 RCTs)	⊕⊕⊕⊕ high^e
	480 per 1000^f	408 per 1000 (389 to 428)			

Number of people who experienced one or more fall-related fractures	All studies population^h		RR 0.73 (0.56 to 0.95)	4047 (10 RCTs)	⊕⊕⊕⊖ lowⁱ
	64 per 1000	47 per 1000 (36 to 61)			
Follow-up: range 4 to 42 months					

Konklusion

- Enhver form for motion er bedre end ingen motion
- Høj-intensitetsmotion kan principielt godt øge BMD
 - Kan det lade sig gøre i praksis?
- Motion skal ordineres under hensyntagen til komorbiditet
- Motion kan forebygge fald og dermed nok fraktur