

Physical Activity for the Prevention and Treatment of Osteoporosis

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Outline

- Necessity
- Bone health
- Primary fracture prevention
- Secondary fracture prevention
- Exercise in different age groups

English ثبت نام نقشه سایت ورود

...Search

پژوهشگاه علوم غدد و متابولیسم
مرکز تحقیقات استئوپروز

صفحه نخست درباره مرکز پژوهش آموزش درمان همکاری بین المللی کمپین روز جهانی یوکی استخوان سامانه ها ارتباط با ما پژوهشگاه علوم غدد و متابولیسم

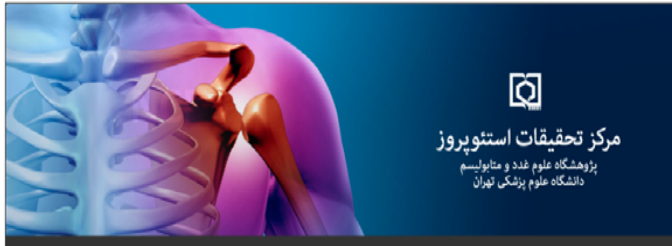
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تاثیرگذارترین موسسه تحقیقاتی در
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<http://emri.tums.ac.ir/ORC/Home>

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WorldOsteoporosisDay October 20

TAKE ACTION FOR BONE HEALTH
OSTEOPOROSIS CAN BE PREVENTED AND TREATED

<https://www.osteoporosis.foundation/>

“TAKE ACTION FOR BONE HEALTH”

- Urbanization and **ageing**
- **Osteoporosis more days in the hospital** than breast cancer, heart attack, diabetes & other diseases.
- The majority of **fragility fracture** patients are neither assessed, nor treated by their health-care system.

https://www.osteoporosis.foundation/sites/iofbonehealth/files/2021-06/WOD_2021-Toolkit.pdf

1/3
WOMEN



1/5
MEN



- **1 fracture** occurs every **3 sec.** **9 million** fractures annually.
- 1 fracture you're twice **at risk for another.**
- Pain
- Loss of independence after a hip fracture **60% require assistance a year later** and **20%** will require long-term

https://www.osteoporosis.foundation/sites/iofbonehealth/files/2021-06/WOD_2021-Toolkit.pdf



Non-Vertebral Fractures

Any broken bone other than those in the spine and skull (e.g., pelvis, femur, tibia, clavicle, ribs, humerus)^{9,10}



Vertebral Fractures

A broken bone in the spine, that is painful or otherwise clinically apparent (e.g. severe deformation or swelling) and may result in reduced physical capability^{9,11}

Take action for bone health



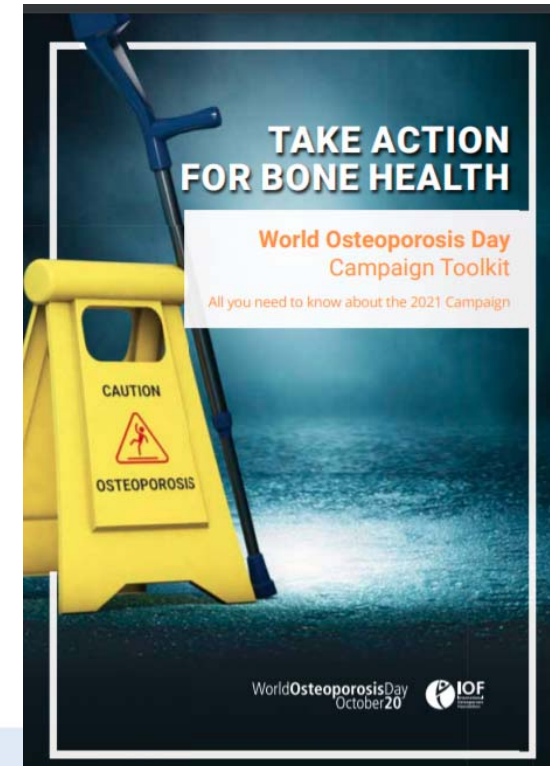
Non-pharmacologic
interventions



Pharmacologic
interventions

Bone health pillars

- Nutrition
- Supplements
- Exercise
- Early osteoporosis diagnosis
- Early enrollment to treatment
- Prevention of primary fracture
- Prevention of secondary fracture



Exercises and Proper Body Mechanics

- Exercise important role in the **Muscle-strengthening**
- exercise can improve **agility, strength, posture, and balance**
- Exercise may modestly **increase bone density.**

BONE HEALTH

Maintaining strong bones as you age can reduce the risk for osteoporosis and related complications, such as painful vertebral compression fractures in the spine. Improve your bone health and protect your body by trying these 7 effective tips today.

Participate in weight-bearing exercise

Regularly performing weight-bearing activities can help build and maintain bone mass. Simple ways to engage in weight-bearing exercise include:



Going for a walk or jog



Climbing stairs or doing bench steps



Doing resistance or strength training

Camacho, Pauline M., et al. "American Association of Clinical Endocrinologists/American College of Endocrinology clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis—2020 update." *Endocrine Practice* 26 (2020): 1-46.

Exercise and bone density

- a meta-analysis of 16 trials including 699 subjects showed a **2% improvement in lumbar spine BMD** in the group that exercised.
- BMD effects of exercise are modest, but a meta-analysis concluded that the exercise-induced improvement in lumbar spine and femoral neck BMD would reduce **osteoporosis fracture risk by approximately 10%**.
- The reduction in fall risk is likely more important than the effects of exercise on BMD, as approximately **95% of hip fractures** are due to a fall.
- Additionally, exercises maintain bone mass by stimulating bone formation and decreasing bone resorption.

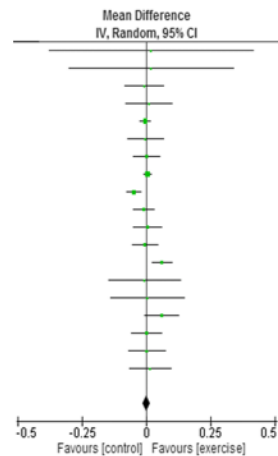
Camacho, Pauline M., et al. "American Association of Clinical Endocrinologists/American College of Endocrinology clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis—2020 update." *Endocrine Practice* 26 (2020): 1-46.

Kanis, John A., et al. "European guidance for the diagnosis and management of osteoporosis in postmenopausal women." *Osteoporosis international* 30.1 (2019): 3-44.

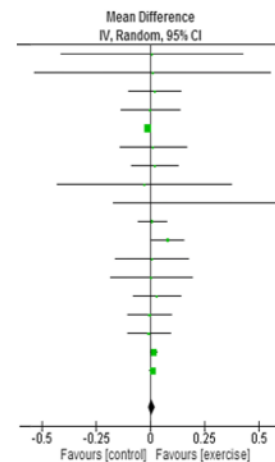
Different Modes of Exercise Training on Bone Mineral Density in Older Postmenopausal Women: A Systematic Review and Meta-analysis Research

- Sixteen RCTs with 1624 subjects were included.
- Our study found **no significant change** in both lumbar spine and femoral neck BMD following exercise training.

Forest plot for the **femoral neck BMD** changes



Forest plot for the **lumbar spine BMD** changes

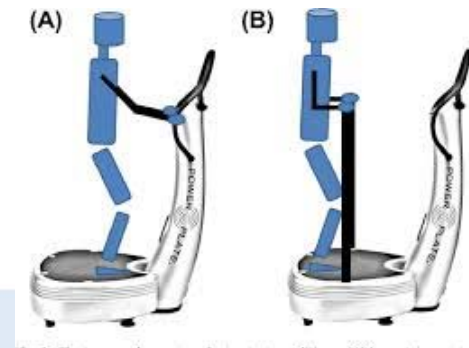


Rahimi, Gholam Rasul Mohammad, et al. "The impact of different modes of exercise training on bone mineral density in older postmenopausal women: A systematic review and meta-analysis research." *Calcified tissue international* 106.6 (2020): 577-590.

10/13/2021

Different Modes of Exercise Training on Bone Mineral Density in Older Postmenopausal Women: A Systematic Review and Meta-analysis Research

- However, subgroup analysis by type of exercise training revealed that **lumbar spine BMD** raised significantly when **whole-body vibration (WBV)** was employed as intervention compared with RCTs that utilized aerobic, resistance, and combined training.
- By contrast, these analyses did not have significant effect on change in **femoral neck BMD**. WBV is an effective method to improve lumbar spine BMD in older.



Rahimi, Gholam Rasul Mohammad, et al. "The impact of different modes of exercise training on bone mineral density in older postmenopausal women: A systematic review and meta-analysis research." *Calcified tissue international* 106.6 (2020): 577-590.

10/13/2021

Osteoporosis Research Center

Effects of Different Types of Exercise on Bone Mineral Density in Postmenopausal Women: A Systematic Review and Meta-analysis

- The 84 eligible exercise groups weight bearing (**WB**, $n = 30$) exercise, resistance exercise (**DRT**, $n = 18$), mixed **WB&DRT** interventions ($n = 36$).
- BMD-changes at lumbar spine (LS), femoral neck (FN) or total hip (TH).
- All types of exercise significantly affect BMD at **LS, FN and TH**.
- Site specificity at the **LS** might be realized by direct muscular insertion of exercises applied in **WB and WB&DRT**
- No significant differences between the types of exercise were observed at the **FN and TH**.

Kemmler, Wolfgang, et al. "Effects of different types of exercise on bone mineral density in postmenopausal women: A systematic review and meta-analysis." *Calcified Tissue International* (2020): 1-31.

Exercise and muscle strength

- The amount of weight-bearing exercise that is optimal for skeletal health in patients with osteoporosis is not known.
- At all times, exercises to improve **muscle strength** and **balance may prevent falls** by restoring confidence and coordination.
- Regular weight-bearing exercise should be advised, tailored according to the needs and abilities of the individual patient.



Kanis, John A., et al. "European guidance for the diagnosis and management of osteoporosis in postmenopausal women." *Osteoporosis international* 30.1 (2019): 3-44.

Role of Exercise in Prevention of Fall and Primary Fracture

Although it is good to be careful, excessive fear of falling can lead to inactivity and prolonged sitting, a cycle which eventually leads to increased falls risk.



A targeted exercise programme that improves your muscle strength and balance will help you reduce your risk of falling and give you confidence to stay active.

Exercise and fall

- The **majority of fractures** are preceded by a **fall**.
- **lifelong** participation in regular, weight-bearing, resistance, and balance-improving exercises to **minimize falls**.
- Several interventions reduce risk of falls; a meta-analysis found decreased fracture risk with exercise.

Camacho, Pauline M., et al. "American Association of Clinical Endocrinologists/American College of Endocrinology clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis—2020 update." *Endocrine Practice* 26 (2020): 1-46.

Compston, Juliet, et al. "UK clinical guideline for the prevention and treatment of osteoporosis." *Archives of osteoporosis* 12.1 (2017): 43.

Exercise and fall...

- Multi-component group and home-based exercise programs, **Tai-Chi** interventions have been shown to reduce the risk of falls
- Falls prevention exercise programs in community dwelling adults **age>60 years** may reduce falls resulting in fracture.

Compston, Juliet, et al. "UK clinical guideline for the prevention and treatment of osteoporosis." *Archives of osteoporosis* 12.1 (2017): 43.

Comparative effectiveness of exercise interventions for preventing falls in older adults: A secondary analysis of a systematic review with network meta-analysis

- 169 studies were included
- The exercise combination ranked with the greatest likelihood of being most effective relative to no exercise was.
- A combination of **balance exercise types** and **flexibility** **reduced number of fallers**
- No reviews have identified specific exercise types that reduce older adult falls.

Sibley, Kathryn M., et al. "Comparative effectiveness of exercise interventions for preventing falls in older adults: a secondary analysis of a systematic review with network meta-analysis." *Experimental Gerontology* (2020): 111151.

The Effects of Physical Exercise on Balance and Prevention of Falls in Older People: A Systematic Review and Meta-Analysis

The meta-analysis showed improvements in patients who underwent physical exercise compared to controls.

dynamic balance

static balance

participants' fear of falling

balance confidence

physical performance

number of patients who fell at least once was significantly reduced

Papalia, Giuseppe Francesco, et al. "The effects of physical exercise on balance and prevention of falls in older people: A systematic review and meta-analysis." *Journal of clinical medicine* 9.8 (2020): 2595.

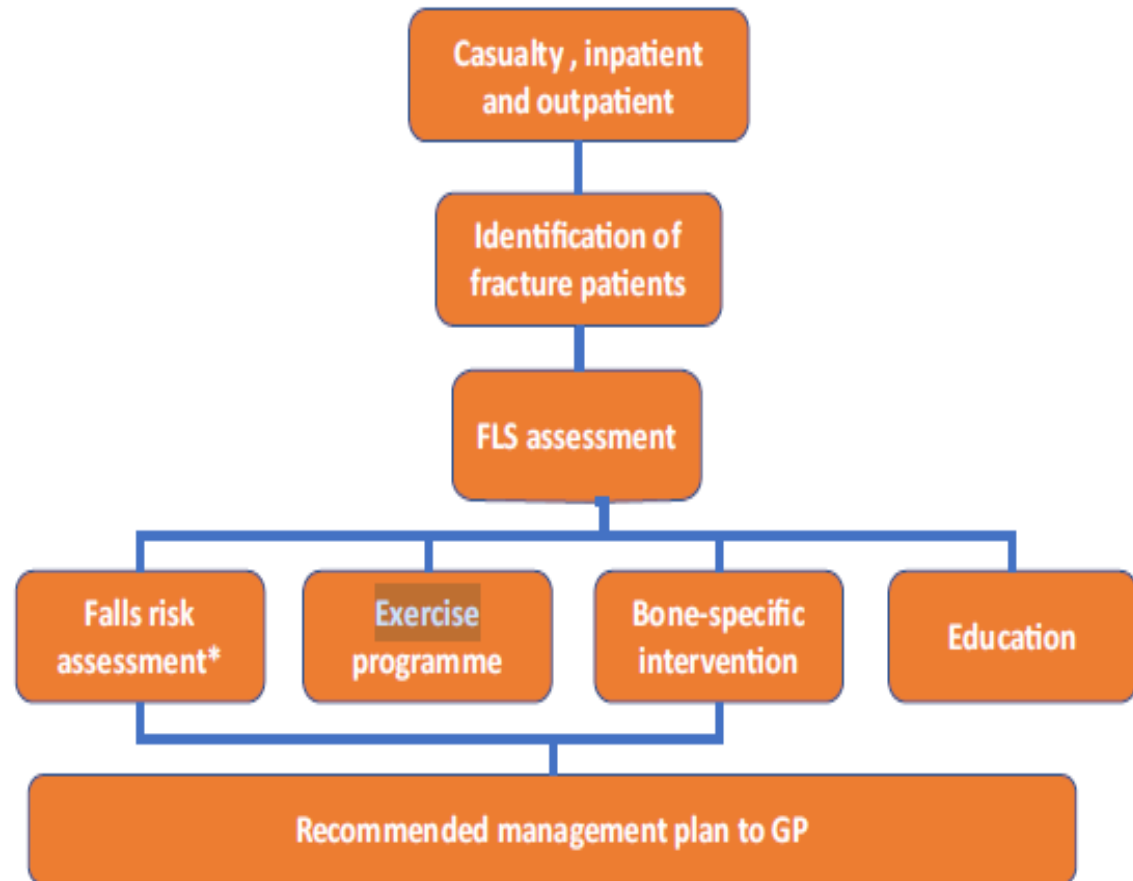
Role of Exercise in Prevention of Secondary Fracture

Capture the Fracture

- Capture the Fracture was developed by the **IOF** to facilitate the implementation of coordinated, multi-disciplinary models of care for **secondary fracture prevention**.
- It is recognized as the single most important step in directly improving patient care and reducing spiraling fracture-related healthcare costs worldwide.

<https://www.capturethefracture.org/>

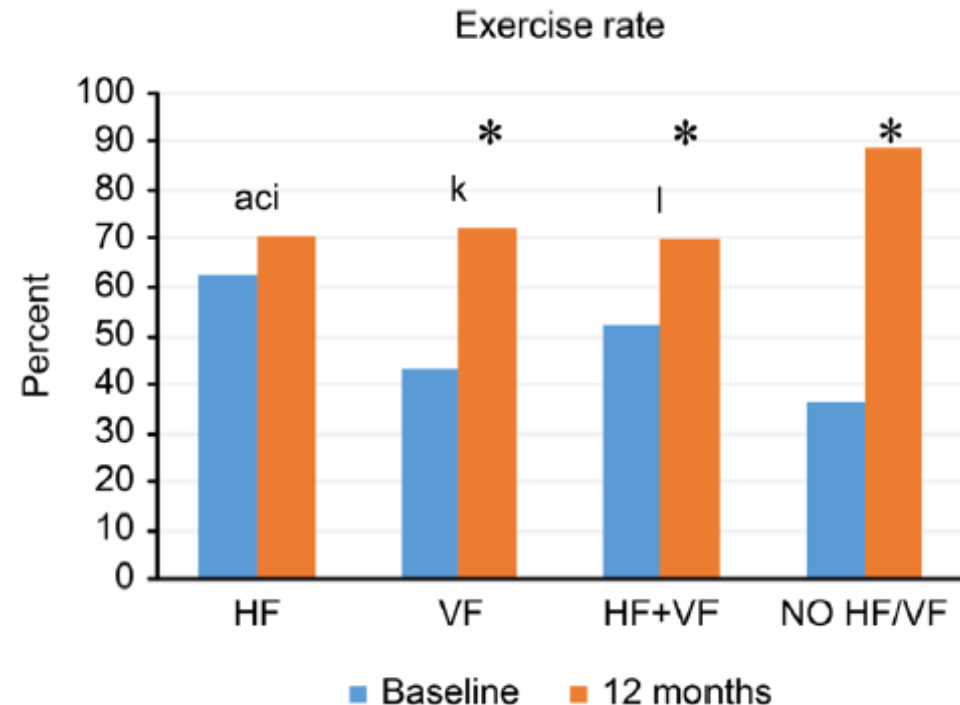
Fig. 13 Schema of a Fracture Liaison Service (FLS) integrated with post-fracture falls risk assessment [after [307]]



Kanis, John A., et al. "European guidance for the diagnosis and management of osteoporosis in postmenopausal women." *Osteoporosis international* 30.1 (2019): 3-44.

Fracture types affect clinical outcomes of patients managed within the fracture liaison and osteoporosis medication management services

- **For exercise rate of 12-month assessment:**
- significant difference from “HF” and “NO HF/VF”
- Significant difference from “VF” and “NO HF/VF”
- significant difference from “HF + VF” and “NO HF/VF”



Chang, Chirn-Bin, et al. "Fracture types affect clinical outcomes of patients managed within the fracture liaison and osteoporosis medication management services." *Scientific reports* 9.1 (2019): 1-10.

Effect of exercise interventions in the early phase to improve physical function after hip fracture – A systematic review and meta-analysis

- Nine studies (669 patients) were included.
- exercise provided **benefit in improving physical function.**
- Exercise in the **early phase of hip fracture** rehabilitation can improve physical function.
- It remains unclear what type of exercise is superior in the early phase after hip fracture.

Beckmann, Monica, et al. "Effect of exercise interventions in the early phase to improve physical function after hip fracture—A systematic review and meta-analysis." *Physiotherapy* 108 (2020): 90-97.

“TAKE ACTION FOR BONE HEALTH”

The best bone building exercises

Weight-bearing
exercises force you to
work against gravity.

- They include walking, hiking, jogging, climbing stairs, playing tennis, and dancing.

Resistance exercises




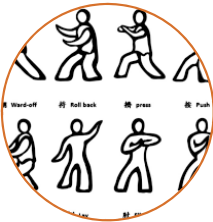




- such as lifting weights can also strengthen bones.

Other exercises

- such as swimming and bicycling can help build and maintain strong muscles but they are not the best way to exercise your bones.

<https://www.bones.nih.gov/health-info/bone/bone-health/exercise/exercise-your-bone-health>

What activities strengthen muscles and bone?

							
carrying heavy shopping bags	yoga	Pilates	tai chi	lifting weights	working with resistance bands	use your own body weight, such as push-ups and sit-ups	heavy gardening, such as digging and shoveling

←

<https://www.nhs.uk/live-well/exercise/physical-activity-guidelines-older-adults/>

Type of sport, physical activity or exercise	Improvement in muscle function	Improvement in bone health	Improvement in balance
 Running	★	★★	★
 Resistance Training	★★★	★★★	★★
 Aerobics, circuit training	★★★	★★★	★★
 Ball Games	★★	★★★	★★★★
 Racquet Sports	★★	★★★	★★★★
 Yoga, Tai Chi	★	★	★
 Dance	★	★★	★
 Walking	★	★	☆
 Nordic Walking	★★	?	★★
 Cycling	★	★	★

★★★ Strong effect ★★ Medium effect ★ Low effect ☆ No effect ? Not known

<https://gpcpd.heiw.wales/clinical/motivate-2-move/chapter-1-the-uk-physical-activity-guidelines/>

Intensity of exercise

As the intensity increases, heart rate, respiratory rate and energy consumption also increase further



Physical activity for early years (birth – 5 years)

Active children are healthy, happy,
school ready and sleep better



Every movement counts

Aim for at least
180
Minutes
per day
for children 1-5 years



Get Strong. Move More. Break up inactivity

UK Chief Medical Officers' Physical Activity Guidelines, 2019

- playing with blocks and other objects
- messy play
- jumping
- walking
- dancing
- swimming
- playground activities
- climbing
- skip
- active play, like hide and seek
- throwing and catching
- scooting
- riding a bike
- outdoor activities
- skipping

<https://gpcpd.heiw.wales/clinical/motivate-2-move/chapter-1-the-uk-physical-activity-guidelines/>

Exercises for healthy bones: under 5 years

- **Babies (under 1 year):** reaching and grasping, pulling and pushing, moving their head, body and limbs during daily routines, and during supervised floor play.
- **Toddlers (aged 1 to 2):** standing up, moving around, rolling and playing, as well as more energetic activity like skipping, hopping, running and jumping.
- **Pre-schoolers (aged 3 to 4)**
- The 180 minutes should include at least **60 minutes of moderate-to-vigorous intensity** physical activity. Children under 5 should not be inactive for long periods, except when they're asleep.

<https://www.nhs.uk/live-well/exercise/physical-activity-guidelines-children-under-five-years/>

Physical activity for children and young people (5–18 Years)



Be physically active



Find ways to help all children and young people accumulate an average of at least 60 minutes physical activity per day across the week

UK Chief Medical Officers' Physical Activity Guidelines, 2019

- **Examples for children include:**
 - walking
 - running
 - games such as tug of war
 - skipping with a rope
 - swinging on playground equipment bars
 - gymnastics
 - climbing
 - sit-ups, press-ups and other similar exercises
 - basketball
 - dance
 - football
 - rugby
 - tennis
- **Examples for young people include:**
 - gymnastics
 - rock climbing
 - football
 - basketball
 - tennis
 - dance
 - resistance exercises with exercise bands, weight machines or handheld weights
 - aerobics
 - running
 - netball
 - hockey
 - badminton
 - skipping with a rope
 - martial arts
 - sit-ups, press-ups and other similar exercises

<https://gpcpd.heiw.wales/clinical/motivate-2-move/chapter-1-the-uk-physical-activity-guidelines/>

Exercises for healthy bones: children and young people

- **aged 5 to 18 :**
- aerobic exercise
- exercises to strengthen their muscles and bones
- aim for an average of at least 60 minutes of moderate intensity physical activity a day across the week

<https://www.nhs.uk/live-well/exercise/physical-activity-guidelines-children-and-young-people/>

Exercises for healthy bones: adults aged 19 to 64

- Examples of moderate intensity activities include:
 - brisk walking
 - water aerobics
 - riding a bike
 - dancing
 - doubles tennis
 - pushing a lawn mower
 - hiking
 - rollerblading
- Examples of vigorous activities include:
 - running
 - swimming
 - riding a bike fast or on hills
 - walking up the stairs
 - sports, like football, rugby, netball and hockey
 - skipping
 - aerobics
 - gymnastics
 - martial arts

Physical activity for adults and older adults



Exercises for healthy bones: adults aged 19 to 64

- **adults aged 19 to 64:**
- work all the major muscle groups (legs, hips, back, abdomen, chest, shoulders and arms) on at least 2 days a week
- do at least 150 minutes of moderate intensity activity a week or 75 minutes of vigorous intensity activity a week
- spread exercise evenly over 4 to 5 days a week, or every day
- One way to tell if you're working at a **moderate** intensity level is if you can still talk, but not sing. For example when walking briskly if you can **still talk, but you can't sing** the words to a song you are working at a moderate intensity.

Exercises for healthy bones: older adults

- Adults aged 65 and over should:
- aim to be physically active every day.
- Any activity is better than none.
- at least 2 days a week
- reduce time spent sitting or lying down and break up long periods of not moving with some activity

<https://www.nhs.uk/live-well/exercise/physical-activity-guidelines-older-adults/>

Exercises for healthy bones: older adults

- **Examples of light activity**
- getting up to make a cup of tea
- moving around your home
- cleaning and dusting
- walking at a slow pace
- vacuuming
- making the bed
- standing up
- **Examples of moderate intensity activities:**
- brisk walking
- water aerobics
- riding a bike
- dancing
- doubles tennis
- pushing a lawn mower
- hiking
- **Examples of vigorous activities:**
- jogging or running
- aerobics
- swimming fast
- riding a bike fast or on hills
- singles tennis
- football
- hiking uphill
- energetic dancing
- martial arts

<https://www.nhs.uk/live-well/exercise/physical-activity-guidelines-older-adults/>

Exercises to avoid

- Individuals with severe osteoporosis should use caution when engaging in activities that involve **forward spine flexion** and **rotation**, **lifting heavy weights**, or **even side bending of the trunk**, because these maneuvers exert compressive forces on the spine that may lead to fracture.
- Before initiating an exercise program in an individual with osteoporosis, a **clinician's evaluation** is recommended.

Camacho, Pauline M., et al. "American Association of Clinical Endocrinologists/American College of Endocrinology clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis—2020 update." *Endocrine Practice* 26 (2020): 1-46.

So you want to do Pilates? and you have Osteoporosis...

ALIGNMENT

AWARENESS

LEG STRENGTH

POSTURE

SPINAL EXTENSION

CORE CONTROL

**WITH LOW BONE DENSITY
AVOID:**

- ROUNDED SPINE ABDOMINAL WORK:** Hundred, Rollup, Rolling, Crisscross, Teaser, Single/Double Leg Stretch, Neck Pull, Open Leg Rocker
- LOADED SPINE FLEXION:** Rollover, Corkscrew Spine Stretch, Jack-Knife, Scissors, Bicycle, Boomerang, Seal, Crab, Control Balance
- DEEP TWISTS:** Spine Twist, Corkscrew Saw, Criss Cross
- PRESSURES ON THE RIBCAGE:** Rocking, Swan 2/3

سمپوزیوم تازه‌های استئوپروز

Symposium on Osteoporosis Updates

چهارشنبه ۵ آبان‌ماه ۱۴۰۰

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راهنمای بالینی مدیریت و درمان بیمای استئوپروز و سارکوپنی

نسخه جدید (سال ۱۴۰۰)

مرکز تحقیقات استئوپروز، پژوهشگاه علوم غدد و متابولیسم، دانشگاه علوم پزشکی و خدمات بهداشتی درمانی تهران

Clinical Guide for the Management & Treatment of Osteoporosis & Sarcopenia

New version (1400)

مرکز تحقیقات استئوپروز، پژوهشگاه علوم غدد و متابولیسم، دانشگاه علوم پزشکی و خدمات بهداشتی درمانی تهران

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Take home message

- **Exercise increases bone mineral density, bone mass, bone strength, bone mechanical properties and muscle strengthen.**
- **bone health assessment, prevention, early detection, treatment enrolment**
- **Take action for bone health**