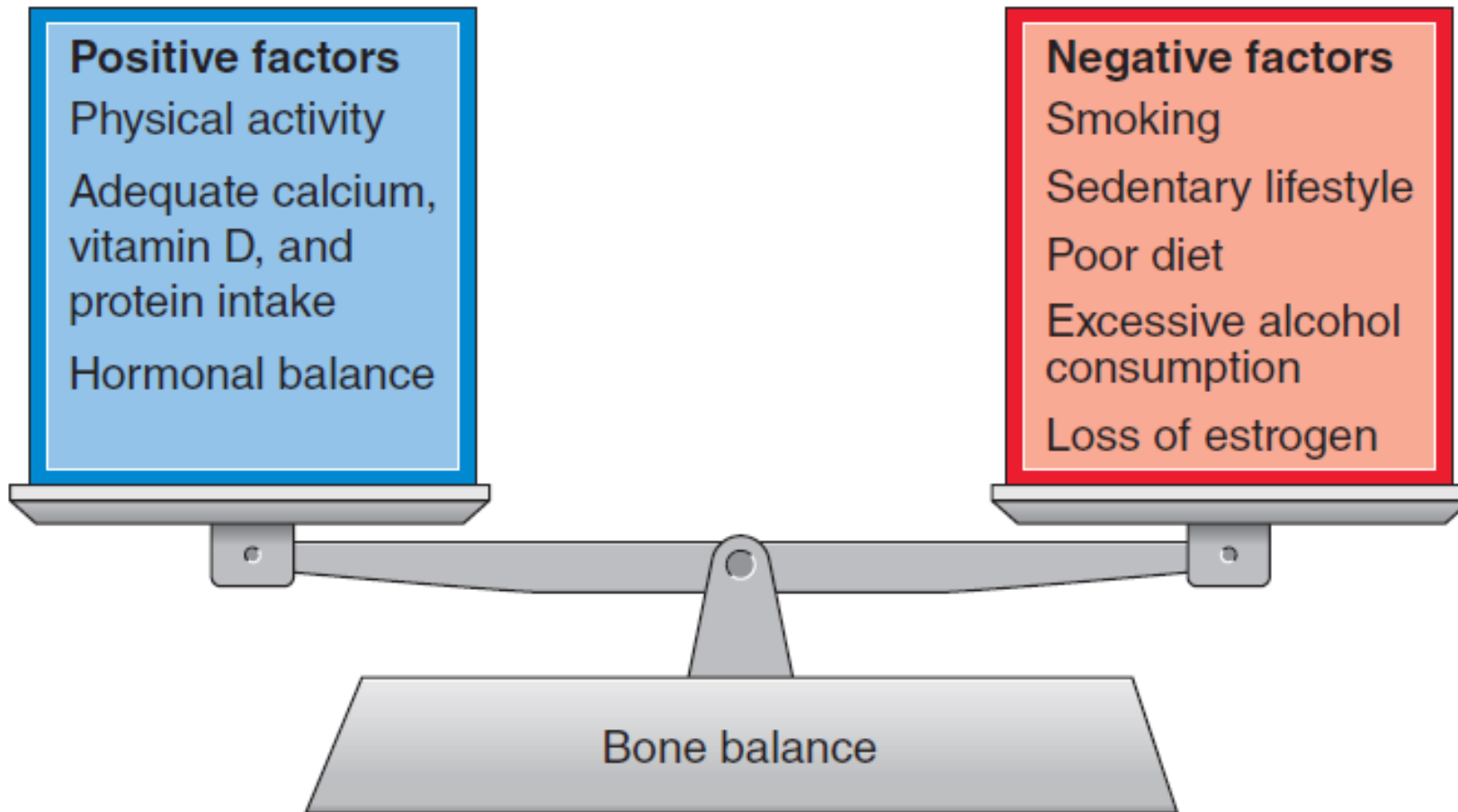
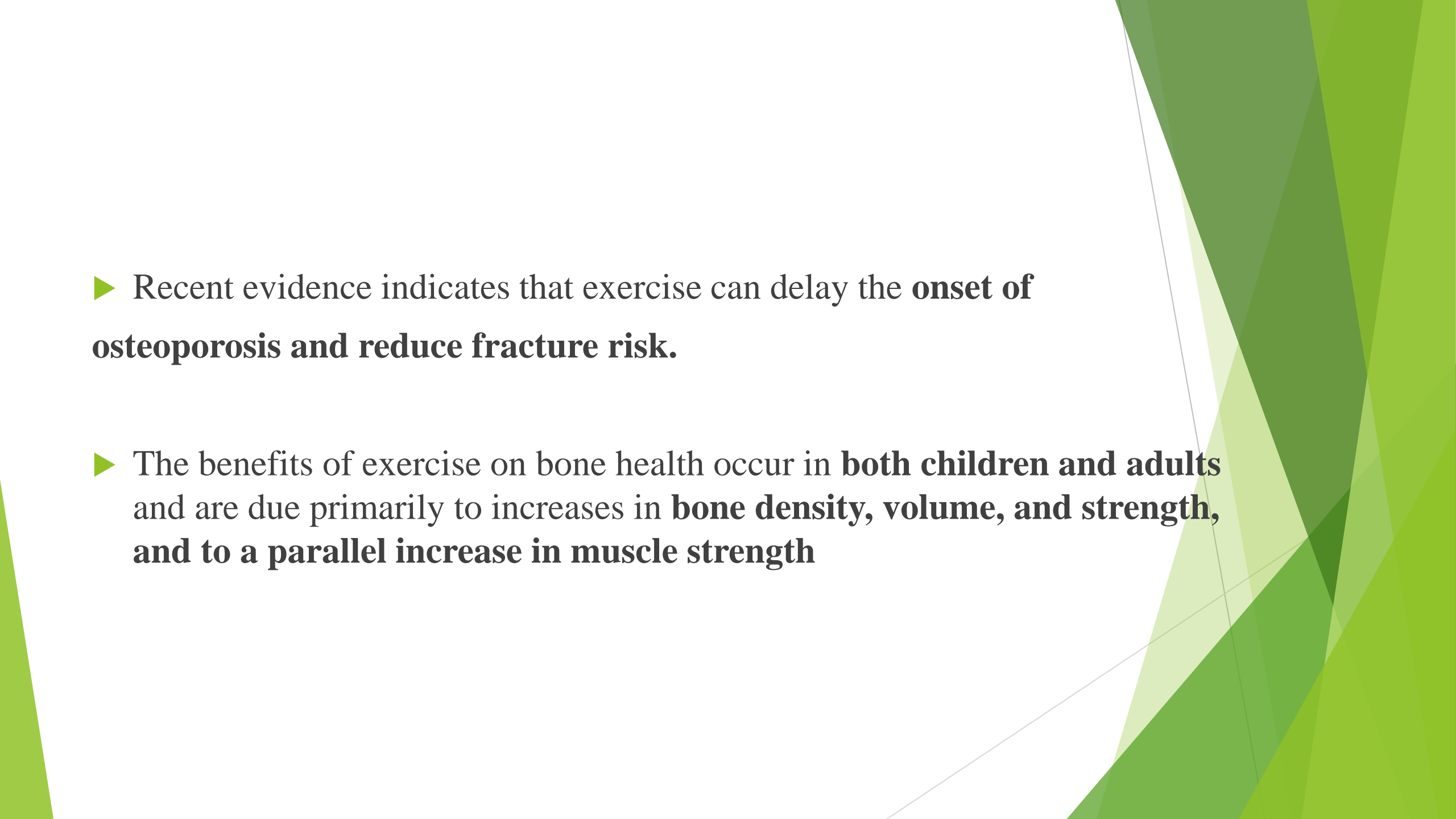



Physical activity and musculoskeletal health

Presented by Dr Maryam Selk Ghaffari

Sports medicine specialist at sports medicine research center



- 
- ▶ Recent evidence indicates that exercise can delay the **onset of osteoporosis and reduce fracture risk.**
 - ▶ The benefits of exercise on bone health occur in **both children and adults** and are due primarily to increases in **bone density, volume, and strength,** and to a **parallel increase in muscle strength**

- 
- ▶ Exercise also improves **balance** in both young and older populations, which can **reduce falls and subsequent osteoporotic fracture risk**
 - ▶ Thus, exercise can generally be regarded as the primary nonpharmacological treatment for prevention of osteoporosis.

- ▶ Nevertheless, many investigators have concluded that large RCTs are still needed in both women and men to determine optimal Ex Rx for preventing both osteoporosis and fracture
- ▶ Recent evidence does indicate a **minimum frequency of two exercise sessions per week** is likely necessary for **increasing BMD** in **osteopenic women**

Although osteoporosis is a disease associated with advancing age, there is almost universal consensus that **healthy behaviors in youth** are important in **reducing the risk of osteoporosis in later life**.

The observation that more than **25% of adult bone mineral** is laid down during **the 2 yr surrounding the age of peak linear growth** emphasizes the importance of the **adolescent years in optimizing bone mineral accrual**

It is estimated that as much bone mineral is laid down during this period as an adult will lose from **50 to 80 year**.

Thus, optimizing bone mineral accrual during the **growing years** is an essential ingredient for the **prevention of osteoporosis later in life**.

EXERCISE DURING YOUTH: BUILDING A STRONG SKELETON

The American College of Sports Medicine (ACSM) position stand on physical activity and bone health states that exercise to optimize bone health in **children and adolescents** should involve **10-20 min , 3 d /week**


impact activities such as **plyometrics, jumping, moderate-intensity resistance training, and sports that involve running and jumping** (*e.g.*, soccer and basketball)

10 jumps, three times per day for more than 8 month was associated with a Significant increase in proximal femur(+ 2.3%) and intertrochanteric region (+3.2%) BMD


To perform their jumps, children simply stood next to their desk and jumped for < 1 min , three times per day when the bell rang.

EXERCISE DURING ADULTHOOD: MAINTAINING A STRONG SKELETON

The goal of exercise in **adulthood** should be to **gain bone strength** and to **offset bone loss** that is observed during this time in life.

- 
- ▶ Trials of exercise lasting 8-12 month in **premenopausal women** generally show increases in **BMD of 1%-3% at** loaded sites (usually the **spine and hip**) compared to controls
 - Gains in bone mineral of exercisers , attenuation of bone loss in exercisers

Trials of exercise in premenopausal women (ages 22-49 year) have shown favorable out comes as a result of **jogging, strength training, aerobics, and jumping exercises**

- 
- ▶ Overall, studies in adults indicate that exercise, if done with **adequate loading** such as **resistance and impact training**, is effective at **attenuating bone loss** observed with advancing age

Exercise Prescription to Preserve Bone Health during Adulthood

The ACSM position stand on physical activity and bone health states that exercise to **preserve bone health** during adulthood should involve **30- 60 min .** of a combination of

moderate-to-high intensity weight-bearing endurance activities (three to five times per week)

resistance exercise (two to three times per week)

and jumping activities

Weight-bearing endurance activities **include tennis, stair climbing, and jogging** at least **intermittently** during walking.


Activities should **involve jumping (e.g., volleyball and basketball)**

and **resistance exercises** such as weightlifting. It is recommended that these exercises should target all **major muscle groups**

Exercise Prescription for Individuals with Osteoporosis

Prior to prescribing exercise for someone with osteoporosis , especially an individual who has recently **experienced a fracture**, an **exercise professional** should consult with the client's physician .

For patients with **debilitating osteoporosis and severe pain** or **recent joint replacement** , exercise program options will be limited.

- 
- ▶ There is a high prevalence of **back pain** in patients with osteoporosis, which is related to **limited functional ability**
 - ▶ Thus, **pain management** may be an important part of the care for individuals with osteoporosis .

A warm pool-based program (*e.g.* **hydrotherapy**) can improve **flexibility and muscle strength** and be an important part of an **exercise program** for these individuals.

In light of the rapid and profound effects of **immobilization and bed rest** on **bone loss** and the **poor prognosis** for recovery of bone mineral content after remobilization,

Even the frailest elderly people **should remain as physically active as their health** permits to preserve skeletal integrity

If a person cannot tolerate active exercises, **functionnal electrical stimulation** may improve vital muscle strength in preparation for active strengthening as pain diminishes

As stated in the ACSM position stand on physical activity and bone health, "Exercise programs for elderly women and men should include not only **weight bearing endurance and resistance activities** aimed at preserving bone mass but also activities designed to **improve balance and prevent falls.**"

Flexibility Training for Individuals with Osteoporosis

A program to increase flexibility can also benefit patients with osteoporosis because decreased flexibility can cause problems with posture

However , many of the commonly prescribed exercises for increasing flexibility, especially of the hamstring muscles, involve **spinal flexion and should be avoided.**

There is little consensus on the optimal training program for increasing flexibility in individuals with osteoporosis, **but slow and controlled movements** should be the rule with stretching, and **ballistic-type stretching should be avoided.**

Aerobic Training for Individuals with Osteoporosis

The primary reasons for prescribing aerobic exercise for those with osteoporosis are to increase aerobic fitness and work capacity, decrease cardiovascular disease risk factors, help maintain bone strength, and **improve balance**.

Aerobic exercise for those with **osteoporosis** should primarily involve **weight-bearing modes of exercise such as walking**.

For those with more significant **osteoporosis-induced pain** who cannot tolerate weight bearing activities, **cycling, swimming, or water aerobics** are possible alternatives.

Aerobic exercise for individuals with osteoporosis should be performed **3-5 d . wk "** ! At an intensity of **40%-59% of heart rate reserve or peak oxygen consumption (V_O 2)** .

An initial goal of **20-30 min per session** is reasonable but may be shorter at the beginning of a program in cases of extreme deconditioning .

Orthopedic limitations may slow progress or mandate the use of additional supports such as handrails for walking.

Once 20-30 min becomes well tolerated, the duration can slowly be increased in much the same fashion as with healthy populations.

If the individual is severely limited by pain , his or her physician should be consulted prior to exercise participation

Resistance Training in Patients with Osteoporosis

Resistance training offers an option to meet both **the bone health** and **fall prevention** criteria on an individual basis .

Resistance training requires little skill and has the added advantage of being highly adaptable to changes in both magnitude and strain distribution.

In addition, increases in strength and muscle size have been demonstrated after resistance training, even in elderly individuals, which has the added benefit of reducing these patients' risk of falls

Improving muscle strength helps to conserve bone and muscle mass and enhance dynamic balance.

Resistance training with **free weights, machines, or elastic bands** is recommended for osteoporotic populations with the loads ideally being directed over the long axis of the bone (axial loading).

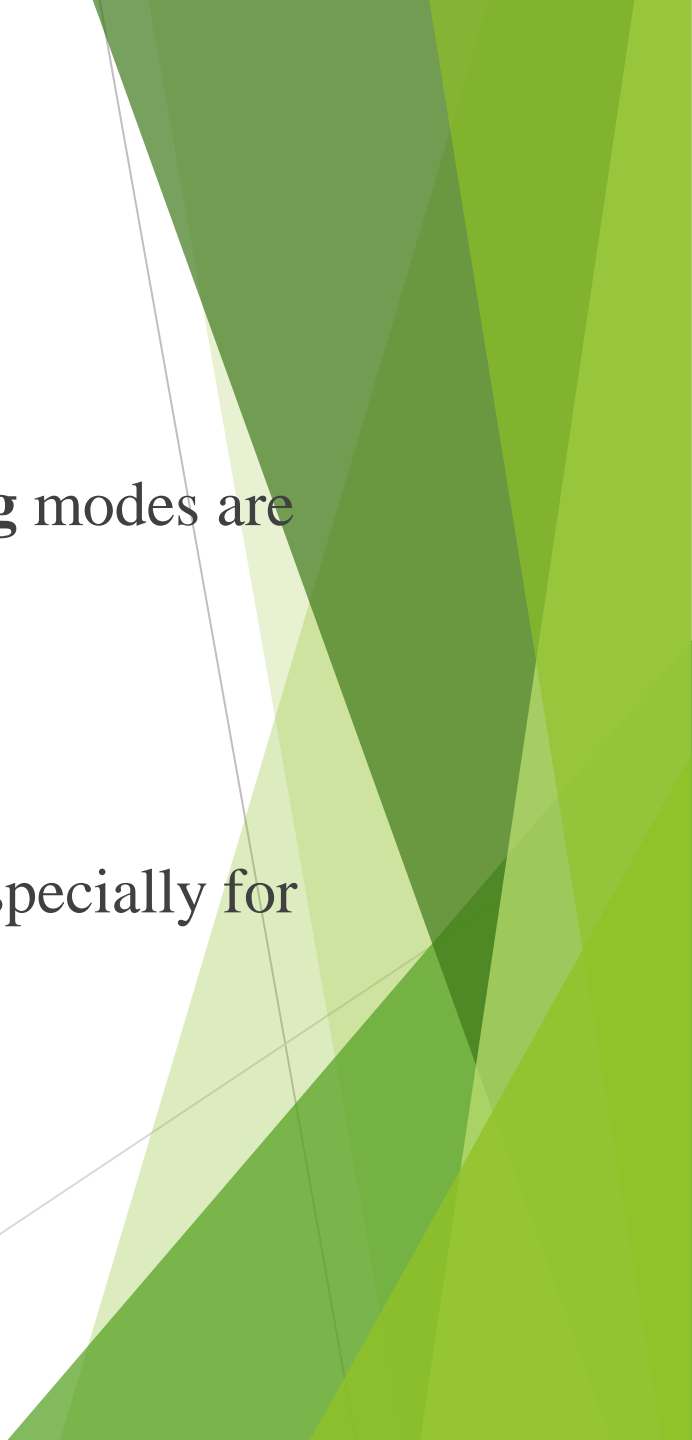
A resistance exercise prescription for individuals *at risk for osteoporosis* should follow the standard adult recommendations of **2- 3 d . wk- 1, using 8-12 repetitions** at an intensity that causes fatigue But not complete exhaustion (60%-80% of 1-RM) for **two to four sets** per exercise using a sufficient number of exercises to involve the major muscle groups


Additionally, those *with* **osteoporosis** should **avoid** any **ballistic or jumping** activities that are recommended for those who are at risk.

The overall goal for the combination of **aerobic and resistance** training exercises for individuals with **osteoporosis** is **30-60 min** exercise .

- ▶ Supervised training appears to be superior to unsupervised training with regard to most outcomes (bone mass, balance, fall prevention),

	Aerobic	Resistance	Flexibility
Frequency	4 to 5 days/week	Start with 1 to 2 nonconsecutive days/week. May progress to 2 to 3 days/week	5 to 7 days/week
Intensity	Moderate intensity (rating of 3 to 4 on a scale of 0 to 10, with 0 being resting and 10 being maximal effort)	Adjust resistance so that the last two reps are challenging to perform High-intensity training is beneficial in those who can tolerate it	Stretch to the point of tightness or slight discomfort
Time	Begin with 20 min Gradually progress to a minimum of 30 min (with a maximum of 45 to 60 min)	Begin with one set of 8 to 12 reps; increase to two sets after ~2 weeks No more than 8 to 10 exercises per session	Hold static stretch for 10 to 30 sec; two to four reps of each exercise
Type	Walking, cycling, or other individually appropriate aerobic activity (weight bearing preferred)	Standard equipment can be used with adequate instruction and safety considerations	Static stretching of all major joints

- 
- ▶ **Weight-bearing aerobic and high-velocity resistance training** modes are recommended.
 - ▶ Proper form and alignment are more important than intensity, especially for those with a history of fractures

- 
- ▶ **Falls** in those with osteoporosis increase the likelihood of a bone fracture.
 - ▶ For older women and men at increased risk for falls, the Ex Rx should also include activities that **improve balance**

- ▶ Primary considerations should be exercises that **strengthen the quadriceps, hamstrings, and gluteal and trunk muscles** because these are the primary balance muscles

- ▶ Tasks done with the **eyes closed** should also be considered for individuals with low- or moderate- (but not high) risk for fracture

- ▶ In light of the rapid and profound effects of **immobilization** and bed rest on bone loss, and poor prognosis for recovery of BMD after remobilization, even the frailest elderly should remain as physically active as health permits because this will best preserve musculoskeletal integrity.
- ▶ Even **short bouts of standing or walking** are desirable during prolonged illnesses.

Contraindications to exercise for individuals with osteoporosis

- ▶ The general recommendation is to prescribe moderate intensity weight-bearing exercise that does **not cause or exacerbate pain**.
- ▶ Exercises that involve **abrupt or explosive movements or high-impact** loading should be avoided, especially in those at high risk for fracture

Several general types of exercise are contraindicated for people with osteoporosis because they can generate large forces on relatively weak bone.

Twisting movements (e.g., golf swing), dynamic abdominal exercises (e.g., sit-ups), jumping or deep forward-trunk flexion exercises (e.g., rowing, toe touches, and full sit-ups), and excessive trunk flexion should all be avoided because they can all result in vertebral fracture.

- ▶ Specific exercises or portions of **group-led routines** (*e.g.*, **yoga, Pilates**) that **require excessive twisting, bending, or compression of the spine** should also be carefully assessed and avoided, particularly in those with very low spinal BMD values

Individuals with osteoporosis should be taught the correct forms for activities of daily living, such as **bending to pick up objects** to avoid vertebral fractures.

- ▶ Exercise training after **hip fracture and surgery** has been found to significantly increase strength, functional ability, and balance as well as to reduce fall-related behavioral and emotional problems in elderly people (8).
- ▶ Recommendations for specific exercises should come from a physical therapist because the activity program needs to be individualized. Generally, these programs begin with safe **range of motion activities and muscle-strengthening exercises for the muscles surrounding the hips, trunk, pelvis, and lower body.**

- ▶ Typically, exercise recommendations include **avoiding high-impact activities such as basketball, volleyball, soccer, jogging, and tennis.**
- ▶ These activities can damage the new hip or loosen its parts. **Resistance exercises that cause hip abduction or adduction (swinging the leg from side to side) should generally be avoided** initially to prevent dislocation of the new hip.
- ▶ Recommended exercises often include **walking, stationary bicycling, and swimming.**

Rehabilitation after vertebral fracture should include exercises to maintain proper posture while moving and exercises specifically aimed at strengthening the **back extensor muscles** (the muscles that help you stand up straight).

Gentle yoga and tai chi are excellent activities to increase postural awareness and muscle strength and to improve balance.

The goals of this type of program should be to reduce pain, improve mobility, and contribute to a better quality of life.



► Thanks for your attention

LETS BE ACTIVE

EVERY ONE

EVERY WHERE

EVERY DAY



