Osteoporosis & Osteoarthritis

Presented by: Jennifer Penrose, Doctor of Physical Therapy (DPT), Board Certified Orthopedic Specialist (OCS), Manual Therapy Certified (MTC)

Owner, Penrose Physical Therapy
What you will learn

- Your posture assessment
- How to improve your posture
- Risky motions and exercises for osteoporosis
- Exercises regarding arthritis (knee & spine)
- How to hip hinge & squat correctly
- How to increase your bone mineral density with exercise
- What exercises are best for increasing core strength
- Balance assessment
- Questions?
Osteoporosis Definitions

- Osteoporosis = porous bone.
- DXA, dual energy x-ray gold standard for Bone Mineral Density testing. (women 65, men 70)
- Normal -1.0 and above
- Low bone density is -1.1 to -2.4
- Osteoporosis -2.5 and lower
Osteoarthritis

- It is the wearing away of the cartilage at the end of the bone
- 1 in 2 adults will have knee arthritis in their lifetime
- Affects 27 million Americans
- Risk factors: Obesity, increasing age, previous joint injury, weak thigh muscles, and genetics.
SQUAT RIGHT.

Keep head up

KNEES OUT
CHEST UP
STRAIGHT BACK
BUM OUT
<table>
<thead>
<tr>
<th>Age</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-64</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>65-69</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>70-74</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>75-79</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>80-84</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>85-89</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>90-94</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Test directions from STEADI - Stopping Elderly Accidents, Deaths, and Injuries.  www.cdc.gov/injury/STEADI
Osteoporosis - how does it happen?

- Age related bone loss or the result of other clinical disorders (hyperthyroidism, diabetes, RA). However, it is a disease that can be prevented and treated.
- More likely to develop if optimal bone mass not achieved in bone building years
Realities and the Future regarding Osteoporosis

- Affects 54 million Americans (60% of people older than 55)
- Every year, there are more spinal vertebral fractures than cardiac events and stroke combined.
- Every 45 seconds a vertebral fracture happens.

(Statistics from the national osteoporosis foundation)
Signs of Vertebral Fracture

700,000 vertebral fractures a year. Most are silent!

- Loss of height (it is not normal to shrink!) > 1.6 inches loss in height = vertebral fracture
- Kyphosis
- Protruding abdomen
- Sudden onset of back pain (not always as many are silent)
Posture Tests & Measures

- Historical height loss of > 4 cm (1.6 inches) suggests incidence of vertebral fracture
- Wall Occiput distance > 4 cm
- Rib-pelvis less than or = 2 fingerbreadths
- More than ½ inch height loss a year
POSTURE

Band pull apart - squeeze shoulder blades and move arms out keep elbows at side.
**Prone thoracic extension lift:**
Hold 10 seconds 10 reps 5 days a week (2yr study showed increased BMD)

Improve your posture!

Prone W

Prone Y on the ball

Prone scap extension
Precautions for People at Risk of Osteoporotic Fracture

- Flexion of the spine (bending) causes increased compression on the anterior vertebral bodies = risk of vertebral fracture
- Avoid high impact loading, exercises that involve end range twisting, bending or compression of the spine (ACSM 8th ed. 2010).
Forces on the lumbar spine with lifting

- Standing upright
- Standing upright, lifting 20 lbs, 10 inches away from low back
- Standing upright, lifting 20 lbs, 20 inches away from low back
- Bent over lifting 20 lbs, 20 inches away from low back
- Bent over lifting 1 lb, 20 inches away from low back

Risk of injury
Risky motions and exercises for those with osteoporosis
How to bend without increasing compression in the spine: Hip Hinge

Hip hinge

Hip hinge training, correct neutral spine

Hip hinge not correct, spine is rounded, not in good neutral position
Time to practice! Sit to stand from the chair and especially work on coming up to stand quickly.

**DON'TS**
1. Don’t start with bent legs.
2. Don’t curve back.

**DO’S**
1. Start with legs straight and arms pointed forward.
2. Keep back straight while bending knees and keeping arms forward. Keep abs engaged.
Abdominal Strengthening without flexion - EMG rank of superficial abdominal muscle activation

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Rectus Abdominis %</th>
<th>External Obliques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Crunch x</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Yoga dolphin plank on ball</td>
<td>105</td>
<td>147</td>
</tr>
<tr>
<td>Yoga side plank</td>
<td>105</td>
<td>139</td>
</tr>
</tbody>
</table>
Core Strengthening

Tighten your abdominals: marching, heel slides, leg extension

Alternating arm & leg (bird/dog) 113%
Weighted Vest to Increase Bone Density
http://weightvest4osteoporosis.com/oregon-study/

<table>
<thead>
<tr>
<th>Exercise wearing weighted vest</th>
<th>% of body weight in vest (0-15%)</th>
<th>8-12 repetitions (1-3 sets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall sits, hold 5-10 seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Squats to 90 dg</td>
<td>*work on coming up quickly from the squat position to demand more force from muscles</td>
<td></td>
</tr>
<tr>
<td>Forward and side lunges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bent knee single leg dead lifts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Push ups (wall, counter, floor)</td>
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</tr>
</tbody>
</table>
Wear the weighted vest for increasing bone density in spine and hips!

Wall sits

Push ups: wall, counter, bed, floor

Single leg dead lift

Forward and side lunges

You can add weights in hands for more resistance as your balance improves
Increase Bone Density!

<table>
<thead>
<tr>
<th>Progressive Weight Bearing Activity (25 min total time) pick one below NOT ALL</th>
<th>Intensity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stairs/steps</td>
<td>Wear weighted vest work up to 10-25#</td>
<td>30 steps (work up to 8 inch high) 10 sets (300 steps)</td>
</tr>
<tr>
<td>Skipping/hopping/dancing Classes at Jubilee</td>
<td>Not wearing weighted vest</td>
<td>25 min total time</td>
</tr>
<tr>
<td>Jumping (if cleared by physician or PT trained to work with osteoporosis)</td>
<td>Start with no weight added to weighted vest, and work up to 10% of BW over 6-9 months.</td>
<td>10 repetitions 5 sets over time is the goal; jumping comfortably 4-5 inches and landing flat footed to evenly distribute the forces</td>
</tr>
</tbody>
</table>
### ACSM Guidelines for People Who at RISK for Osteoporosis

(ACSM 8th ed, 2010).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Weight bearing aerobics 3-5 days/wk and resistance 2-3 day/wk</td>
</tr>
<tr>
<td>Intensity</td>
<td>Mod (60-80% of 1 RM 8-12 reps) 1 to 3 sets to high (80-90%, 5-6 reps for resistance)</td>
</tr>
<tr>
<td>Time</td>
<td>30-60 min/day of combination of weight bearing aerobic ex and resistance training</td>
</tr>
<tr>
<td>Type</td>
<td>Weight bearing aerobic, activities that involve jumping, and resistance</td>
</tr>
</tbody>
</table>
## ACSM Guidelines for People WITH Osteoporosis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency</strong></td>
<td>Weight bearing aerobic 3-5 days/wk and resistance 2-3 day/wk</td>
</tr>
<tr>
<td><strong>Intensity</strong></td>
<td>Mod 60-80% 1 RM 8-12 reps of resistance exercise 1-3 sets in terms of bone loading forces, although some may tolerate more</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>30-60 min/day of combination of weight bearing aerobic and resistance</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Weight bearing aerobic, activities and resistance exercises</td>
</tr>
</tbody>
</table>
1 RM evaluated; 60-80% 8-12 reps, 1-3 sets, 2-3x a week!

Leg press machine

Spine extension

Hamstring
Keep your spine straight! Good form/posture at all times.
Keep your back from rounding!

This room with the physioballs, BOSU, balance pads, steps, yoga mats is my favorite! We can teach you so many great exercises with these items!
Balance
Summary

- Your posture assessment
- How to improve your posture
- Risky motions and exercises for osteoporosis
- Exercises regarding arthritis (knee & spine)
- How to hip hinge & squat correctly
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- Balance assessment
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Resources & References

- [http://weightvest4osteoporo...](http://weightvest4osteoporosis.com/oregon-study/)
- [https://www.nof.org/patients/](https://www.nof.org/patients/) national osteoporosis foundation
- [https://vimeo.com/194902726](https://vimeo.com/194902726) Video on safe movement techniques to prevent spine fractures
- Sumiaki Maeo, Ta... [Trunk Muscle Activities During Abdominal Bracing: Comparison Among Muscles and Exercises](https://journals.lww.com/jsms) 2013 Sep; 12(3): 467-474.


Soraya Pirouzi, PhD,¹ Farahnaz Emami, MSc,² Shohreh Taghizadeh, MSc,³ and Ali Ghanbari, PhD¹ Is Abdominal Muscle Activity Different from Lumbar Muscle Activity during Four-Point Kneeling? Iran J Med Sci. 2013 Dec; 38(4): 327-333.

Effects of high-intensity

Olson M. Abdominal strengthening without flexion - EMG comparison of deep abdominals and rectus abdominis. 2013.


Thank you!

- PowerPoint slides on [www.penrosept.com](http://www.penrosept.com) under the Resources tab.
- Email [Jennifer@penrosept.com](mailto:Jennifer@penrosept.com)