

Are You Too Fit To Fracture?

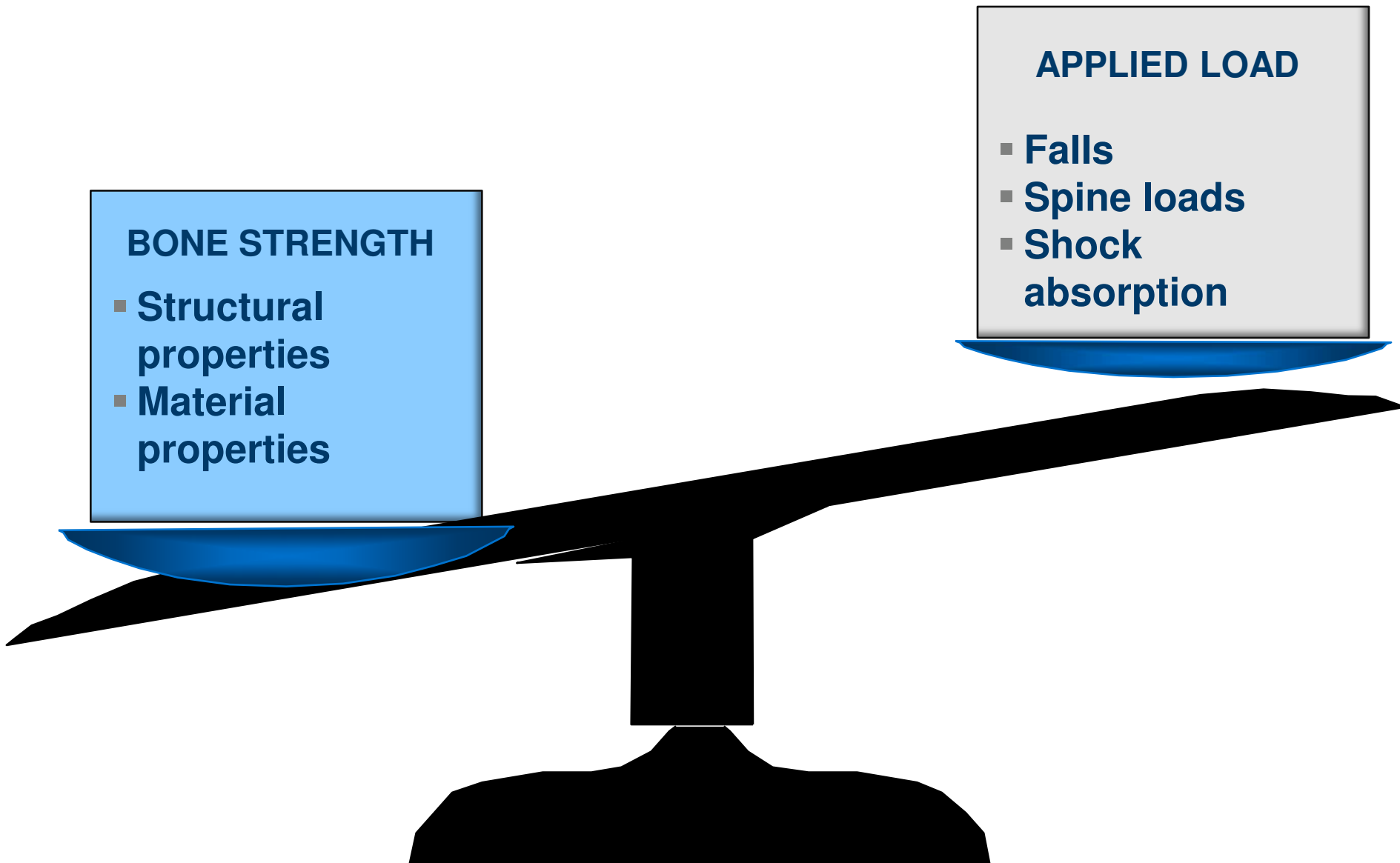
New exercise and physical activity recommendations for individuals with osteoporosis

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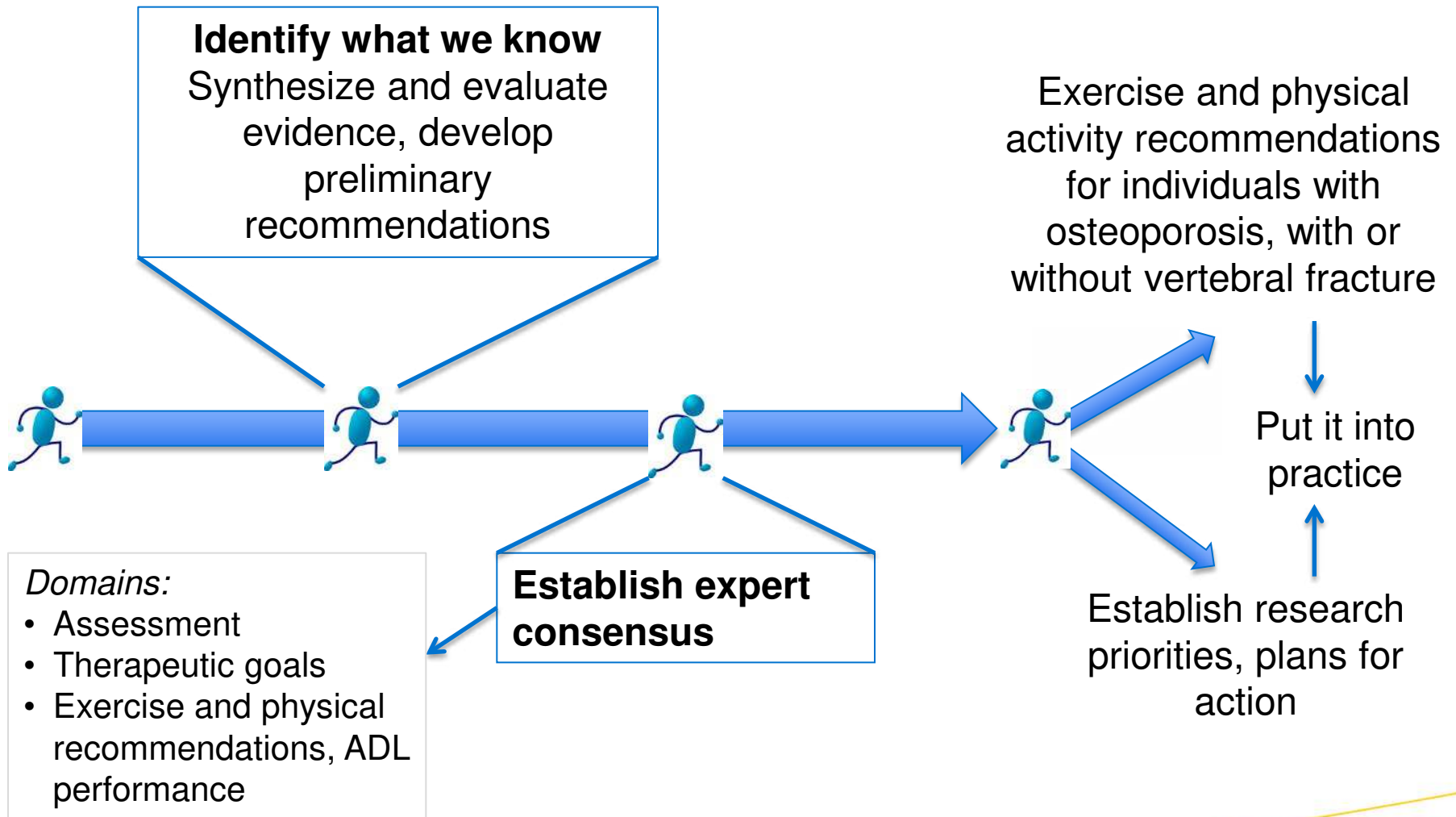
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Fractures occur when...



What is Too Fit To Fracture?



Key points to look for

- Encourage strength training $\geq 2\text{x/wk}$ and balance training daily
- Add in aerobic physical activity
- Walking is not enough
- Encourage attention to posture, exercises for back extensor muscles **daily**
- Spine sparing strategies \downarrow spine loads

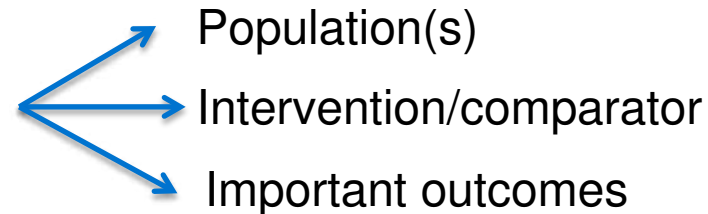
Knowledge synthesis GRADE Process



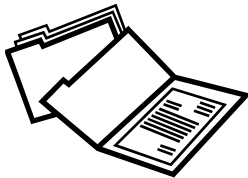
Form an international panel of experts
Identify patient groups/stakeholders



Develop Clinically
Important Questions



Evidence retrieval, assessment, synthesis
Generate a GRADE evidence profile



Form recommendations:

- Benefits and harms
- Values and preferences
- Resource use

GRADE Recommendations

Recommendations for older adults with osteoporosis or osteoporotic vertebral fracture:

- We strongly recommend that individuals with osteoporosis engage in a multicomponent exercise program that includes resistance training in combination with balance training.
- We recommend that individuals with osteoporosis do not engage in aerobic training to the exclusion of resistance or balance training.

Consultation with a physical therapist is recommended for older adults with osteoporotic vertebral fracture to ensure safe and appropriate exercise.

Giangregorio LM, Papaioannou A, Macintyre NJ, Ashe MC, Heinonen A, Shipp K, Wark J, McGill S, Keller H, Jain R, Laprade J, Cheung AM. Osteoporos Int. 2014 Mar;25(3):821-35.



Image credit: <http://commons.wikimedia.org/wiki/Boots>

These boots are made for walking, but these bones need balance training and strength training too.

Frequently Asked Questions:



What exercises should I do?

Can I participate in yoga?

How much should I lift?

How do I get rid of this “hump” on my back?

Is it safe for me to do ab exercises?

75 experts identified



RAND/UCLA Delphi consensus process - Round 1 (R1):

- 3 clinical cases (moderate risk, high risk with one or with multiple fractures, pain, curved spine)
- Open-ended questions on assessment, exercise, those commonly asked by patients.



Content analyses – initial recommendations developed



70 experts invited to Round 2 (R2) - asked if they agreed with each set of recommendations or not, and to comment. Content analyses repeated, recommendations revised.

Consensus on FAQ - Cases

All cases: 68 years old, 168 cm tall, 65kg, osteoporosis based on bone mineral density

CASE 1: Osteoporosis, with no history of vertebral fracture or other risk factors - “**moderate risk**”

CASE 2: Osteoporosis with history of one vertebral fracture – “**high risk**”

CASE 3: Osteoporosis with multiple vertebral fractures, pain with daily activities, “curved” spine - “**high risk**”

What therapeutic goals should be targeted in individuals with osteoporosis?

Prevent fractures via:

1) fall prevention:

- improve dynamic balance, mobility, muscle strength, posture

2) safe movement or spine sparing strategies:

- attention to posture during movement to protect the spine
- train back extensor muscles to improve endurance
- stretch muscles restricting optimal posture

3) prevention of further bone loss:

- exercise may not have a certain effect on bone mineral density.
- muscle strengthening and weight-bearing dynamic exercise

When setting goals or prescribing exercise, what key things should a health care provider ask, observe, screen for, or assess?

- 1. Medical history, comorbidities, exercise contraindications**
- 2. Fracture risk** - FRAX or CAROC, or assessment of risk factors
- 3. Fall risk** –acute fall, ≥ 2 falls in past 12 months, gait/balance difficulties
- 4. Physical performance** - impairment or pain during movements
- 5. Standing posture** - look for hyperkyphosis, hyper- or hypolordosis;
- 6. Barriers and facilitators to physical activity** - e.g., current physical activity, self-efficacy, time, pain, access, preferences.

How are our recommendations different from national physical activity guidelines?

Individuals with osteoporosis, no spine fracture:

- Resistance training to ↑ muscle strength, 2x/week, 8-12 reps per set
- Balance exercises daily, 15-20 min per day
- 150 min/wk of moderate- to vigorous intensity aerobic physical activity, in bouts ≥ 10 minutes
- Exercises to improve endurance in back extensor muscles, 5-10 min per day

0	- Nothing at all
1	- Very light
2	- Fairly light
3	
4	- Somewhat hard
5	- Hard
6	
7	- Very hard
8	
9	
10	- Very, very hard

Borg, G.V. (1982) Psychological basis of perceived exertion. *Medicine and Science in Sports and Exercise*, 14, 377-381.

How are our recommendations different from national physical activity guidelines?

Individuals with osteoporosis and spine fracture:

- Resistance training to ↑ muscle strength, 2x/week, 8-12 reps per set
- Balance exercises daily, 15-20 min per day
- 150 min/wk of **moderate- intensity** aerobic physical activity, in bouts ≥ 10 minutes
- Exercises to improve endurance in back extensor muscles, 5-10 min per day
- **Emphasis on good alignment rather than intensity**

0	- Nothing at all
1	- Very light
2	- Fairly light
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Borg, G.V. (1982) Psychological basis of perceived exertion. *Medicine and Science in Sports and Exercise*, 14, 377-381.

For those with a history of a spine fracture:

- Focus on form and achieving good alignment, rather than intensity.
- Choose position with least spine load: lying on back > standing > sitting
- Consult a Bone Fit™ trained instructor
- If a consultation with a Bone Fit™ trained instructor is not possible, may want to use resistance bands or body weight as resistance.

First-timers Fab Five

- Squats or sit-to-stand exercises or lunges for legs and buttock muscles
- Heel raises for lower legs
- Wall pushups for chest and triceps
- Bow and arrow “pulls” with an exercise band for upper back and biceps
- Diagonal shoulder raises with exercise band for shoulders and upper back.



What is balance training?

Balance training is defined as “...the efficient transfer of bodyweight from one part of the body to another or challenges specific aspects of the balance systems (e.g., vestibular systems)” and balance retraining is defined as “... from the re-education of basic functional movement patterns to a wide variety of dynamic activities that target more sophisticated aspects of balance.”

<http://www.profane.eu.org/taxonomy.html>

Example exercises

Reducing Base of Support in Static Stance:

- One-legged stand
- Tandem or semi-tandem stand
- Standing on heels or toes only

Shifting Weight, Moving to Limits of Stability

- Shifting weight between heels and toes

Dynamic balance exercises:

- Walking on toes or heels only
- Tandem Walk
- Figure 8s
- Sit-to-stand or squat
- Walking backwards

Three-dimensional Movement

- Tai Chi
- Dancing

TANDEM STANCE WITH SUPPORT



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Stand with good posture while holding a sturdy chair. Imagine your torso is a box.

Your shoulders and hips are the corners. Keep the torso box straight.

Place the back of your right heel in front of the toes on your left foot.

- ☐ Put only two fingers on the chair or support object
- ☐ Do it without holding on to support object
- ☐ Do it with eyes closed (keep support object nearby)

HOLD FOR _____ SECONDS • REPEAT THE EXERCISE WITH THE OTHER LEG



WALKING IN A PATTERN

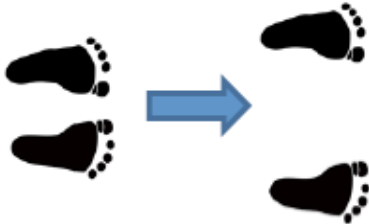
☐ HEEL TO TOE



Try walking in an unusual pattern to challenge your balance.

Walk with this pattern for _____.

☐ STEP AEROBICS – TWO NARROW STEPS, THEN TWO WIDE STEPS



Here are some other ones you can try:

- ☐ Step over cones or cups
- ☐ Walk in a figure 8
- ☐ Walk forward or backward, and count forward by 6s
- ☐ Walk forward or backward, and count backward by 6s

☐ SIDEWAYS OR GRAPEVINE



Balance training: Progression for Pros

- Gradually reduce contact with supportive objects.
- Pick harder standing still exercises e.g., stand on one foot
- Add weight shifting to “standing still.”
 - *Example: stand on one leg then shift weight between heels and toes.*
- Progress from “standing still” exercises to exercises that challenge balance while moving.
 - *Example: progress from doing heel raises on one leg to walking on your toes.*
- Do mental challenge or close eyes while doing balance exercises.
 - *Example: count backward from 100 by 7s while walking on your toes.*

Aerobic physical activity is not getting a bad reputation

Recommendations:

- ≥ 5 days per week (150 min/week minimum), ≥ 30 minutes per day, in ≥ 10 min bouts, moderate or vigorous intensity (5-8 on a 0-10 scale).
- Weight-bearing aerobic activity most often
- Consider preference, ability, access etc.
- Individuals with vertebral fracture should aim for moderate, rather than vigorous intensity
- **Tools:** Shoes with good traction. Environment without fall hazards - avoid slippery ground/floors or cluttered spaces.

Endurance Training for Back Extensor Muscles

What type of activity? Supine presses/holds → prone extension to neutral → core activation in standing

How often each week? 5-10 minutes per day of posture exercises, and attention to posture during daily activities.

Tools: A mirror and a floor mat or soft but supportive surface.

Individuals with a history of a spine fracture:

- Might need a pillow under head if spine is curved
- Supine lying at intervals throughout the day “unloads”, and promotes extension of the spine and stretches front shoulders and chest.
- Attention to alignment more important than intensity.
- Consultation with a Bone Fit™ trained professional

- 5-10 min per day lie flat on firm mattress or floor
- Legs straight, or if uncomfortable, bent or resting on pillow under knees
- Only use a pillow if your head does not reach floor
- Imagine your collar bones are wings, and spread your wings without pulling your shoulders back



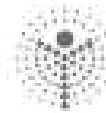
1. Lie on back in decompression/unloaded position.
2. Press the backs of shoulders downward into the supporting surface (DO NOT squeeze shoulders together or tuck the chin).

PERFORM _____ REPETITIONS • PERFORM _____ SETS

NOTE: ONLY DO THIS EXERCISE IF PRESCRIBED TO YOU BY A HEALTH CARE PROVIDER. Photography © 2013 Bone Fit™. All rights reserved.

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BAD POSTURE



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Over time, having poor posture can lead to pain and possibly damage to our body. Check regularly that you are avoiding these habits:

- **Forward head posture:** is your chin jutting out past your chest or your ears ahead of your shoulders?
- **Rounded Shoulders:** are your shoulders positioned in front of your hips? Are your palms facing backwards?
- **Rounded middle back:** are you slouching so that your spine between your shoulder blades is becoming curved?
- **Slumped lower back:** are you slouching so that your lower spine is becoming flattened or losing its natural curve?

GOOD POSTURE



Check regularly that you stand with good posture, by reminding yourself of the following:

- Balance your weight evenly on both feet.
- Gently draw the belly in
- Keep your gaze straight. Gently tuck your chin in.
- Draw your breastbone up slightly.

From the front:

Imagine your torso is a box. Your shoulders and hips are the corners. Keep the top corners above the bottom corners – this is keeping the box straight.



From the side:

Visualize a straight line through your ear, shoulder, hip and foot. Use this to practice aligning your posture.

Other cues to help you obtain good posture:

- Imagine you are wearing a fancy necklace or bowtie. Lift the chest to show it off.
- Imagine your collar bones are wings – spread your wings slightly without pulling your shoulders back.
- Take a breath and fill the back of your lungs first.

Can I do yoga? How much can I lift?

Recommendations re: “risky” physical activities

Restriction = disincentive to participate in physical activity

Individuals with osteoporosis but no history of spine fracture:

- If history or strong desire to do activity → may be able to modify
- Can do most activities → practice “spine sparing”
- Very high-impact sports, high fall risk, contact → **instead do low impact, slow pace**

What is spine sparing?

- Modify activities that apply rapid, repetitive, weighted or end-range **flexion** or **twisting** torque to the spine → **instead do slow, controlled twist in supine or supported trunk flexion**
- Learning how to lift weight more important than how much to lift

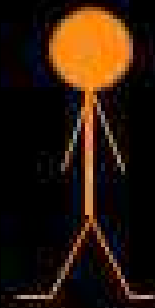
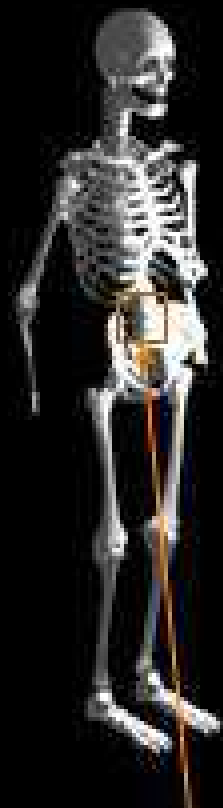
Can I do yoga? How much can I lift?

Recommendations re: “risky” physical activities

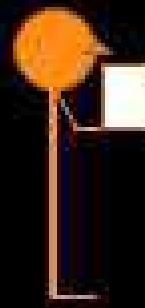
Restriction = disincentive to participate in physical activity

Individuals with osteoporosis and spine fracture, especially with pain or “curved” spine:

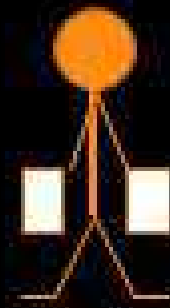
- Consult BoneFit trained individual for advice on physical activity
- Consult BoneFit trained physical or occupational therapist on daily activities
- Risk of sports, many exercise machines/classes may outweigh benefits
- Consider classes taught by BoneFit trained instructors
- May need to get help beyond light ADLs, avoid sitting long periods
- Practice “spine sparing” always



A



B



C

Flexed
30° at
hips →

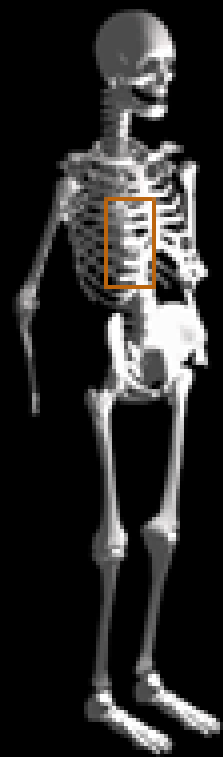


D

Quiz Time!


Which position places the most load on the vertebrae in the low back (lumbar spine)?
What about the vertebrae in the mid-back?

■ = 10kg weight (5kg in each hand)



Flexed
30° at
hips →




 = 10kg weight
(5kg in each hand)

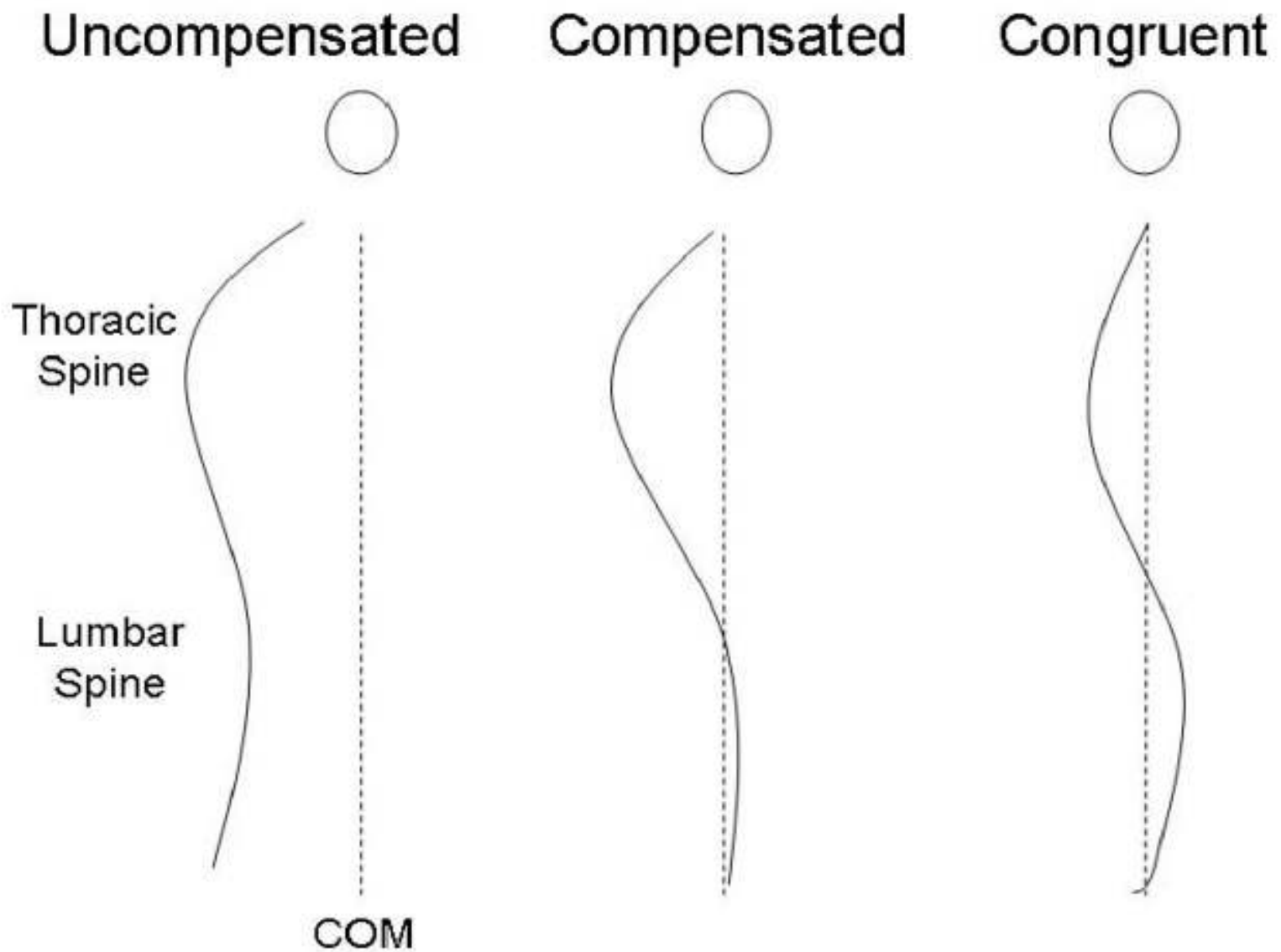
Of the four positions, this one places the most load on the lumbar (low back) spine. The load starts to increase in the lower thoracic spine (T10) and increases at each lower level of the spine

References: Iyer et al 2010 *Clin Biomech.* 2010; 25:853–858



 = 10kg weight
(5kg in each hand)

Of the four positions, this one places a similar high load on the spine from the mid thoracic to the lower lumbar region. This position is only lower than forward bending holding a 10kg weight in the lowest 3 vertebral bodies.



Forces at T8 and T12 are greatest for the uncompensated posture, followed by the compensated posture, and least in the congruent posture. Forces at T12 > T8, and differences between postures greater. Forces are increased with 5kg weight in each hand with elbows flexed 90 degrees.

Mechanical loads on the spine influenced by:

- Falls
- Body posture or activity
- Spinal curvature
- Person's height & weight
- Muscle forces
- Disc degeneration
- Neuromuscular control



A Guide for an **OSTEOPOROSIS EXERCISE ACTION PLAN**. Locate a Bone Fit trained instructor:

English: 1-800-463-6842 / French: 1-800-977-1778 or www.bonefit.ca

Type	How often per week?	How hard should I work?	Examples and Comments
Strength Training	≥2 days a week	8-12 repetitions per exercise. Intensity of 5-8 on a 0-10 scale 0=rest, 10=max	Min. 1 exercise each for: legs; arms; chest; shoulders; back. Use: exercise bands; weights, or body weight against gravity. 1-3 sets/exercise. <i>Train at ↓ intensity initially if: sedentary; conditions affecting activity; high fracture risk; strength training novice</i>
Balance Training	Daily for ≥15-20min	Progress from “standing still” exercises” to dynamic.	Can do during daily walks or activities: Standing still: ↓ base of support e.g., Semi-tandem stance, one-leg stand; shift weight between heels & toes while standing Dynamic movements: Tai Chi; tandem walk, dancing
Aerobic Exercise	≥5 days per week, ≥30min/day	Moderate- to vigorous-intensity	Do bouts of 10 minutes or more – accumulate 30min/day. On a 0-10 scale where 0=rest, and 10=maximum effort, aim for intensity of 5-8.
Spine Sparing	During Daily Activities	Alignment more important than intensity.	Modify activities that flex (bending forward) or twist the spine; most risky when rapid, repetitive, weighted, bending all the way forward, or twisting to the side. Videos: www.osteoporosis.ca/after-the-fracture/videos/
Back Extensor Training	Daily for 5-10 min	Perform “holds” 3-5 seconds.	Lie face up on firm surface, knees bent, feet flat. Use pillow only if head doesn’t reach floor. Press the back of head gently into surface without changing chin position, hold. Repeat 3-5 times. See “Intro to theraband” in videos .

“...sometimes people do very stupid things in the name of expediency, [such] as balancing on a chair to reach a light bulb or to dust high shelves”.

	Instead of:	Do:
End-range trunk flexion	Yoga/Pilates movements that involve flexion	Supported flexion, not to end-range e.g. modified downward dog with hip hinge and chair
End-range trunk rotation	Trunk rotation machine or twisting movements for abs	Side plank on wall or floor
End-range trunk rotation	Yoga/pilates twisting postures	Slow, controlled twisting in supine
Precarious balancing	Standing on a chair	Use a step stool with a wide base of support and non-slip materials on the stepping surface and interface with floor.
Bending or lifting	Forward bending with spine, or lifting load away from body	Bend with knees and hips not spine. Use lower body to help lift. Stand close to load when bending, hold load close to body.
Turning, with or without load in hand	Twisting with feet planted	Step to turn, so that leading foot and torso face same direction

HOW NOT TO MOVE A BOX



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Do not bend over only from the waist or round your spine to reach and pick up any items.

Do not twist when putting an item down.



HOW TO MOVE A BOX



...Continued.

5. Hold the item in front of and close to your body.
6. Step to turn around, do NOT simply twist, to place the object in another spot.
7. Once you have turned around, bend at the knees while keeping your back straight and place the item down.

Key points to look for

- Encourage strength training $\geq 2\text{x/wk}$ and balance training daily
- Add in aerobic physical activity
- Walking is not enough
- Encourage attention to posture, exercises for back extensor muscles **daily**
- Spine sparing strategies \downarrow spine loads

What's next?

- Too Fit To Fracture and Bone Fit across Ontario (bonefit.ca)
- Developing new tools and resources
- Ongoing clinical trial “Build Better Bones with Exercise”
 - Women 65+ yrs, spine fracture related to osteoporosis
 - London, Waterloo, Hamilton, Toronto, Vancouver

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The logo for the University of Waterloo is located in the bottom left corner. It consists of the words "UNIVERSITY OF" in a smaller, black, sans-serif font, positioned above the word "WATERLOO" in a larger, bold, black, sans-serif font. To the right of the text, several thin, curved lines in various colors (yellow, magenta, green, teal, blue, and red) sweep upwards and to the right, creating a dynamic, abstract graphic element that spans the bottom of the page.