

# Too Fit To Fracture:

A Consensus to Establish Recommendations on Exercise and Physical Activity for Individuals with Osteoporosis, with or without Spine Fractures

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Giangregorio LM, Cheung, AM, Heinonen A,  
McGill S, Laprade J, Ashe MC, Shipp K,  
Wark JD, MacIntyre NJ, Keller H, Jain R,  
Papaioannou A.



# Patients Ask:



What exercises should I do?

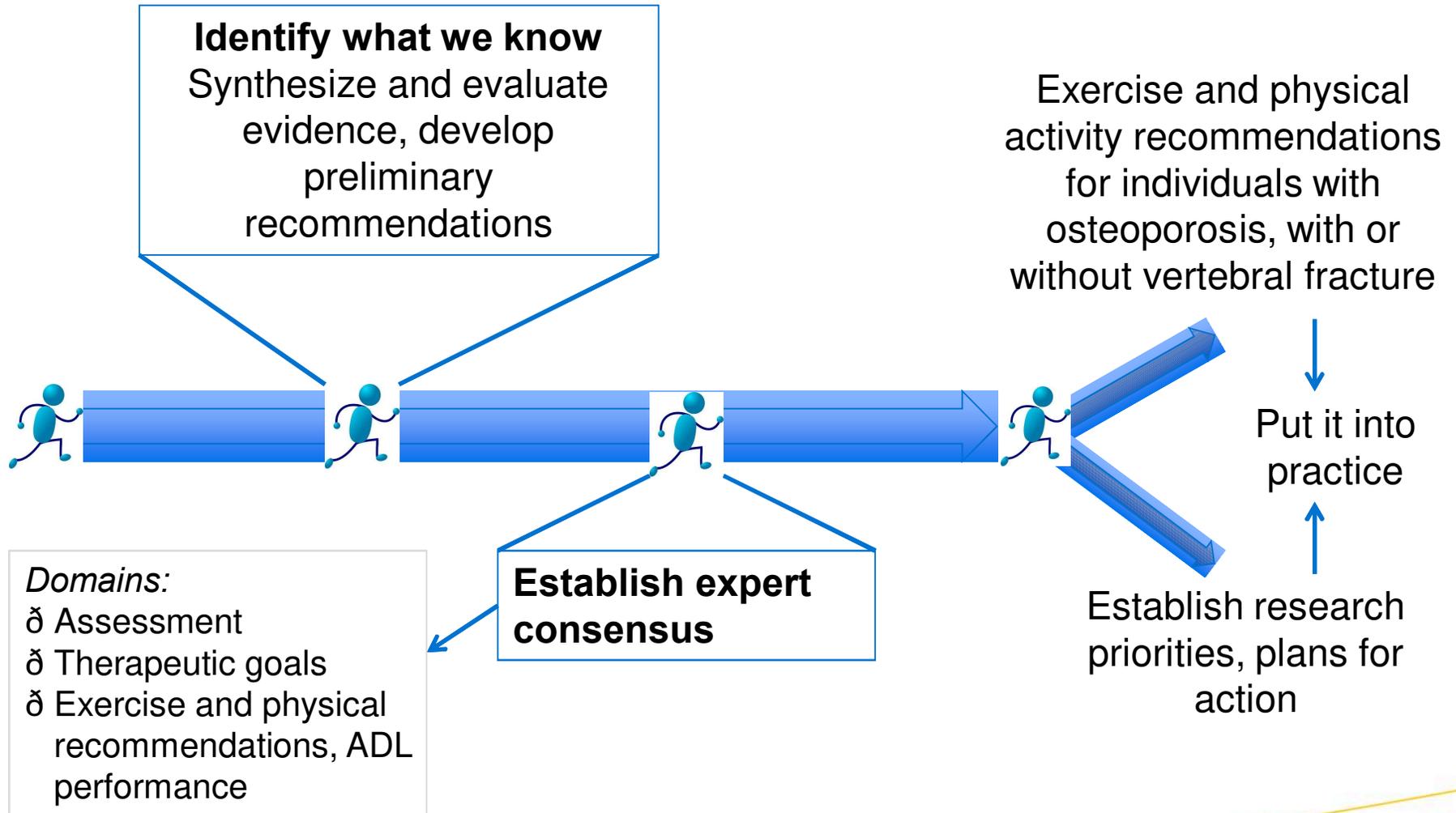
Can I participate in yoga?

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?

# What is Too Fit To Fracture?



# TRUE or FALSE?

I do activities to increase muscle **strength**, such as lifting weights or working with resistance exercise bands, twice a week or more.

I do activities that challenge my **balance**, such as Tai Chi, dynamic balance activities or `standing still`\_balance challenges on most days of the week.

I do **moderate or vigorous intensity aerobic physical activity** for at least 30 minutes on 5 or more days per week, in bouts of 10 minutes or more.

I do exercises to improve my **posture** daily.

I pay attention to my posture during daily activities, to avoid excessive twisting or forward bending.

I **progressively increase the intensity** of the exercises I do over time, so that they are always challenging me.

# Key points to look for

- ð Train your muscles for strength (ñ 2x/wk)
- ð Challenge your balance **daily**
- ð Add in aerobic physical activity
- ð Walking is not enough
- ð Pay attention to posture, train back extensor muscles **daily**
- ð Practice spine sparing strategies

# GRADE Recommendations

## **Recommendations for older adults with osteoporosis or osteoporotic vertebral fracture:**

- ǒ We strongly recommend that individuals with osteoporosis engage in a multicomponent exercise program that includes resistance training in combination with balance training.
- ǒ 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.

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

# 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 ħ 10 minutes
- Exercises to improve endurance in back extensor muscles, 5-10 min per day

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

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 ħ 10 minutes
- Exercises to improve endurance in back extensor muscles, 5-10 min per day
- Emphasis on good alignment rather than intensity
- Choose position with least spine load: lying on back > standing > sitting

0	- Nothing at all
1	- Very light
2	- Fairly light
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4	- Somewhat hard
5	- Hard
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# Strength Training

**How often each week?** 2 days per week.

**How hard should I work?** You can perform 8-12 repetitions safely, but the last few repetitions are challenging to do.

**What type of activity?** Work against resistance through the range of motion.

**Tools:** Use resistance bands, weights or your own body weight as resistance.

**Progression:** Gradually “ repetitions, sets, weight, **or** difficulty or number of exercises

## **If you have a history of a spine fracture:**

- đ Focus on form and achieving good alignment, rather than how hard you are working.
- đ Consult a Bone Fit<sup>u</sup> trained instructor
- đ If a consultation with a Bone Fit<sup>u</sup> trained instructor is not possible, it is best for you to use resistance bands or your body weight as resistance.

# First-timers Fab Five

- ð Squats or sit-to-stand exercises or lunges for legs and buttock muscles
- ð Heel raises for lower legs
- ð Wall pushups for chest and triceps
- ð Bow and arrow `pulls\_ with an exercise band for upper back and biceps
- ð Lateral raises with an exercise band for shoulders, back and arms.



# Balance training

**How often each week?** Daily - 15-20 minutes each day.

**How hard should I work?** Safe, but a little challenging. If you cannot do it for 5 seconds or less without losing your balance → too challenging. If you can hold it easily without wavering for 30 seconds → not challenging enough.

**How long should I do it for?** 2 hours/wk or 15-20 minutes/day, can build into daily activities.

**What type of activity?** Challenge balance both standing still and during dynamic movement. Dancing and Tai Chi count as dynamic balance challenges!

**Tools:** Use a support object or have one nearby. **Example:** hold on to a chair, counter or wall, or have one nearby. Shoes with good traction. Soft flooring.

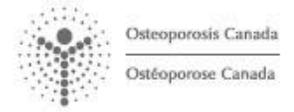
**Progression:** Reduce contact with support objects, progress from standing still to dynamic exercises, add weight-shifting or mental challenges.

# First-timers Fab Five

- ð Standing with the inside of one heel touching the big toe of the other foot
- ð Heel raise and hold
- ð Shifting weight between your heels and toes while standing
- ð Make your `usual\_ walk unusual
- ð Practice your dance moves



# 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

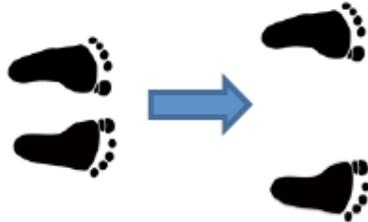
## HEEL TO TOE



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

- ð Gradually reduce contact with supportive objects.
- ð Pick harder standing still exercises e.g., stand on one foot
- ð Add weight shifting to `standing still. *Example: stand on one leg then shift weight between heels and toes.*
- ð 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.*
- ð Do mental challenge while doing balance exercises. *Example: count backward from 100 by 7s while walking on your toes.*

# Aerobic Physical Activity

**How often each week?** 5 or more days per week (150 min/week minimum).

**How hard should I work?** Moderate or vigorous intensity. The difficulty level should be 5-8 on a 0-10 scale.

**How long should I do it for?**  $\geq$  30 minutes per day,  $\geq$  10 minutes at a time.

**What type of activity?** Activities that increase your heart rate and make you breathe harder than you usually do. Weight-bearing activities such as walking, fitness classes, dancing and stair climbing are best.

**Tools:** Shoes with good traction. Environment without fall hazards - avoid slippery ground/floors or cluttered spaces.

**Progression:** “ the amount of time spent performing the activity, the number of sessions per day or per week, or the difficulty level.

**Is sitting the new smoking? Sit less, move more!**

# Posture training

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

**How hard should I work?** Attention to alignment more important than intensity.

**What type of activity?** Start with `Shavasana` and looking at your posture in the mirror.

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

**Progression:** Progress to active exercises to improve back extensor endurance on advice of a Bone Fit` trained professional!

**If you have a history of a spine fracture:**

- You might need a pillow under your head if your spine is curved
- Lying on your back at intervals throughout the day `unloads`, and promotes extension of the spine and stretches front shoulders and chest.

- 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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# GOOD POSTURE



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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.

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# 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:**

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

**What is spine sparing?**

- ǒ 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**
- ǒ Learning how to lift weight more important than how much to lift

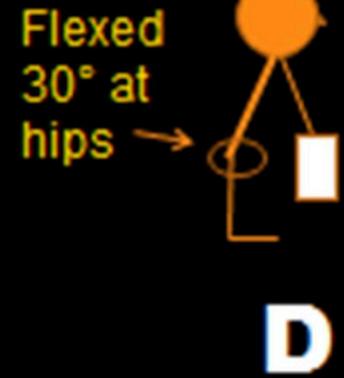
# Can I do yoga? How much can I lift?

## Recommendations re: “risky” physical activities

**Restriction = disincentive to participate in physical activity**

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

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



## 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.**

# Mechanical loads on the spine influenced by:

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



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**“...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”.**

	<b>Instead of:</b>	<b>Do:</b>
<b>End-range trunk flexion</b>	Yoga/Pilates movements that involve flexion	Supported flexion, not to end-range e.g. modified downward dog with hip hinge and chair
<b>End-range trunk rotation</b>	Trunk rotation machine or twisting movements for abs	Side plank on wall or floor
<b>End-range trunk rotation</b>	Yoga/pilates twisting postures	Slow, controlled twisting in supine
<b>Precarious balancing</b>	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.
<b>Bending or lifting</b>	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.
<b>Turning, with or without load in hand</b>	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.**



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# HOW TO MOVE A BOX

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...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

- ð Train your muscles for strength (ñ 2x/wk)
- ð Challenge your balance **daily**
- ð Add in aerobic physical activity
- ð Walking is not enough
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- ð Practice spine sparing strategies

# TRUE or FALSE?

I do activities to increase muscle **strength**, such as lifting weights or working with resistance exercise bands, twice a week or more.

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I **progressively increase the intensity** of the exercises I do over time, so that they are always challenging me.

# Pick **one** new goal

- đ What are you going to do?
- đ How are you going to do it?
- đ Where are you going to do it?
- đ When are you going to do it? What is the trigger?

# Stick with it Strategies

- ð Write out your plan in detail
- ð Find triggers to make it a habit
- ð Use a calendar to keep track
- ð Develop back-up plans
- ð Call a friend

# What's next?

- đ Too Fit To Fracture and Bone Fit across Ontario ([bonefit.ca](http://bonefit.ca))
- đ Developing new tools and resources
- đ 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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