



**Telehealth for Falls and Fracture  
Prevention Implementation Trial**

Dr Jenny Gianoudis has a conversation with

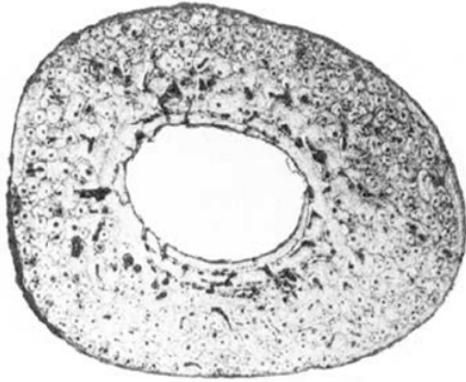
**PROF. ROBIN DALY**

Chair of Exercise and Ageing, Institute for Physical  
Activity and Nutrition, Deakin University

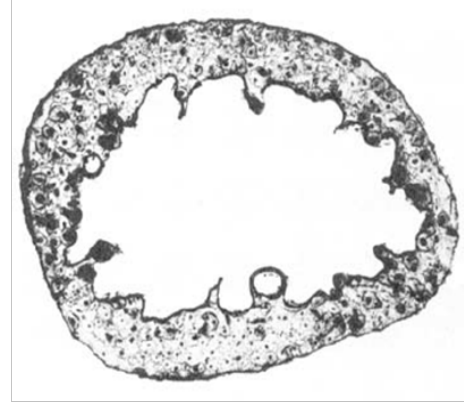
Educational Module 4



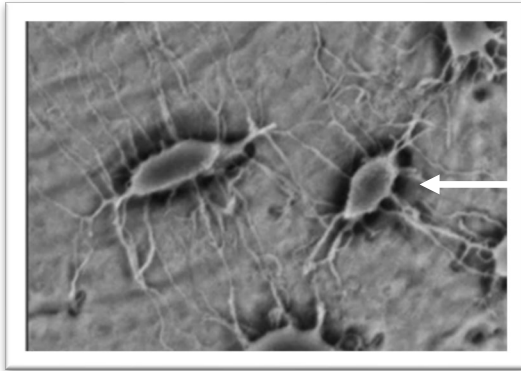
**Exercise for Optimizing  
Bone Health**



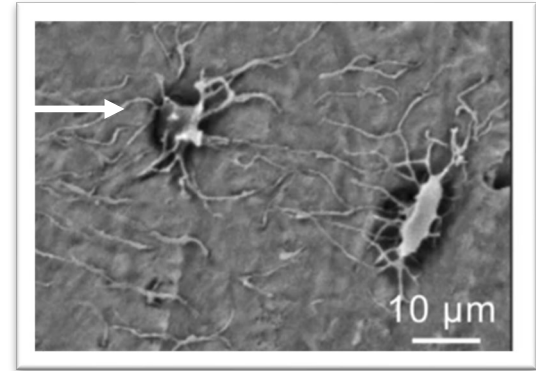
**Normal**



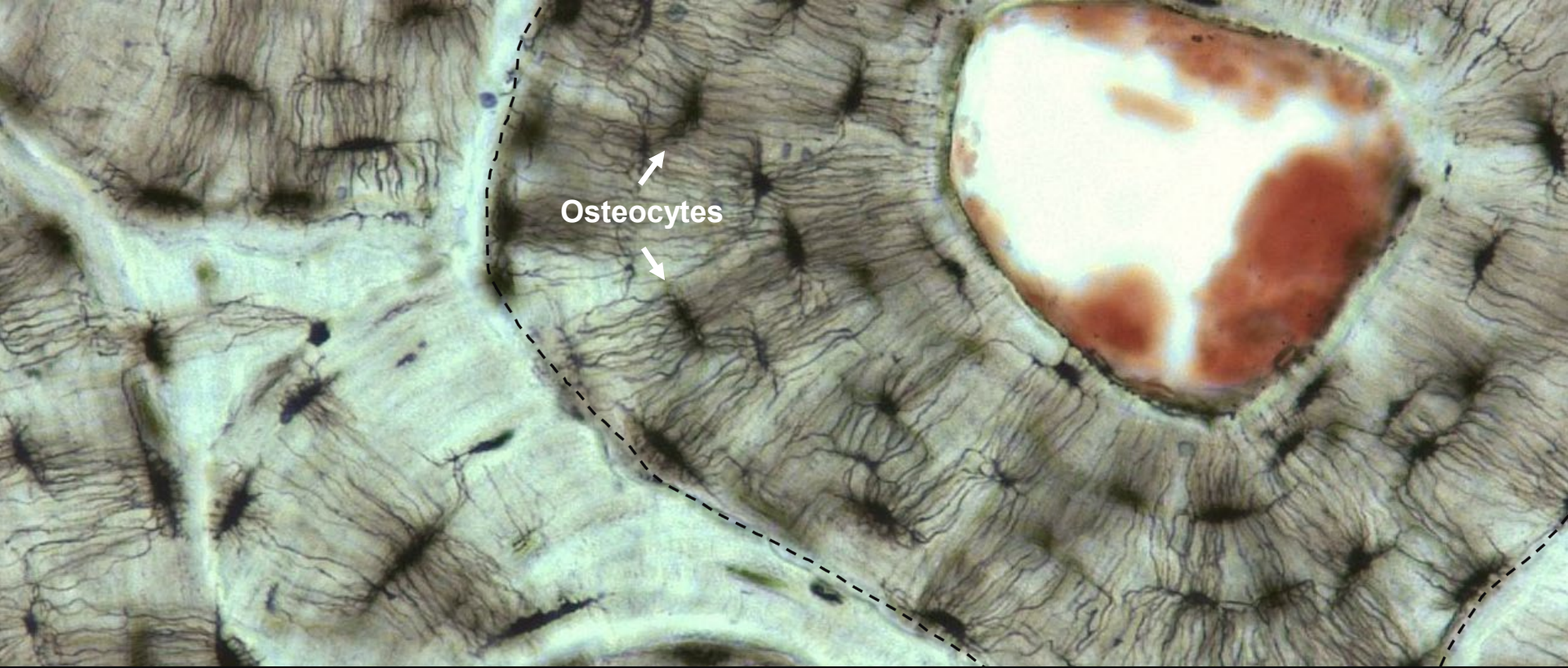
**Disuse**



**Osteocytes**  
strain sensitive  
cells in bone



Adapted from Rolvien and Amling, Calcif Tissue Int 2022



**Osteocytes are fabulous gossipers...**  
*if you arouse them!*



## **Key Loading**

Characteristics for Bone

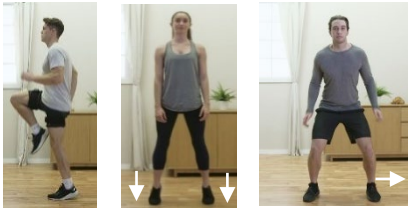
- **Dynamic impact** loads are better than static activities.
- **Rapidly applied loads** are better than slow movements.
- **Novel or unusual loads** are more stimulating than repetitive loads.
- **Few impact loads** are needed to stimulate bone ► de-sensitized!
- Shorter exercise bouts with **rest periods** are most effective.

# Impact Exercise Levels Defined

## Low

Activity in which there is a small amount of impact through the bones. Usually, at least one foot remains on the ground.

*Examples: walking, side steps and gentle heel drops.*



## Moderate

A moderate force is created by pushing off and returning to the ground; usually both feet leave the ground but with less height and force than with high impact.

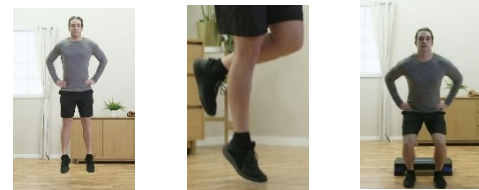
*Examples: running, stride jumps, jump rope, Highland-type dancing, jumps and hops.*



## High

A large force is created on returning to the ground, usually from a greater height (e.g., from a higher jump or from a higher jump to a lower level).

*Examples: landings from exertional jumps such as high vertical jumps, star jumps, tuck jumps and drop landings from bench.*



<https://www.bgs.org.uk/resources/strong-steady-straight-nos-exercise-and-osteoporosis-consensus-statement>

# Targeted Weight-Bearing Exercises

## Stationary Exercises



Marching / stomping



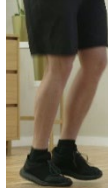
Forward step up



Step up knee lift



Drop squats



Side-to-side shuffle



Scissor jumps on spot



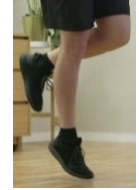
Star jumps



Mini jumps

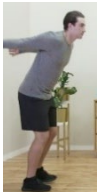


Alternate lunge jumps



Stationary hopping

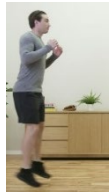
## Forward Movement



Forward leap



Forward jump and stick



Forward & back jumping



Single leg hop



Drop jump



Lateral bounding



Lateral step up/down



Side-to-side jump



Clock jumping



Single leg side-to-side hop

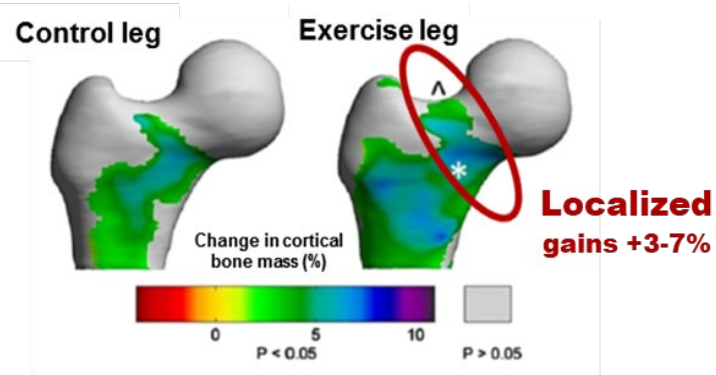
## Lateral Movement

# Hip-Hop Study

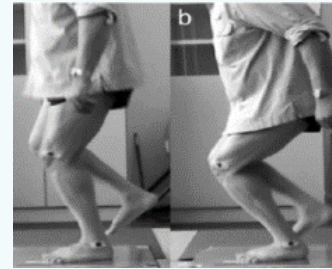
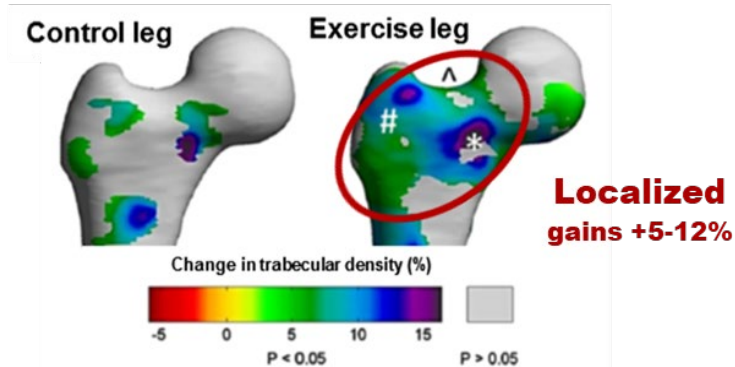
Two-minutes of daily loading

**50** single leg multi-directional jumps daily (5 sets x 10 bouts) for 12 months

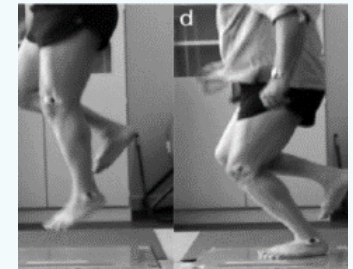
Cortical density



Trabecular density



Take off loads  
2.2 times body weight

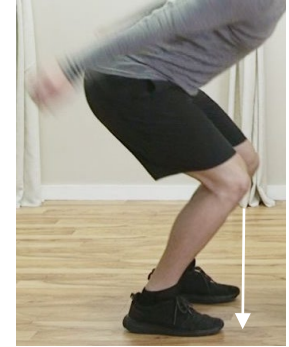
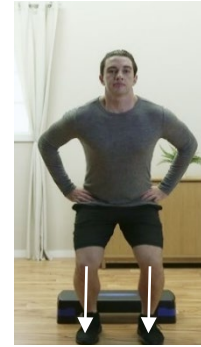
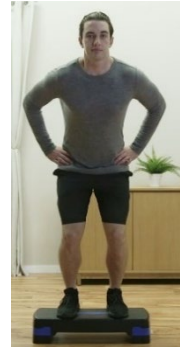


Landing loads  
2.7 times body weight

# Impact Exercise Considerations

## Weight-bearing / Impact Activities

- Teach **correct landing technique** when commencing and with all new exercises.
- **Progress slowly**; may need to introduce after a period (4-8 weeks) of lower limb muscle strengthening.
- Add **variety** (multi-directional movements) if moderate-high loads are not tolerated.
- For those with **incontinence issues** first strengthen pelvic floor muscles and avoid jumping exercises with feet wide apart.



### DO NOT

- Allow the knees to buckle(roll) inwards upon landing.
- Allow the shoulders to sway forward or the spine to flex upon landing.
- Land flat on the feet.
- Continue if you experience any pain.



# Resistance Training

## Key Principles for Bone & Muscle

- ✓ Moderate-high intensity
- ✓ Progressive overload
- ✓ Exercise specificity



# *Multi-component* **Exercise Program**



Weight-bearing Impact



Resistance Training



Challenging Balance



# Key Recommendation



- A **combination** of **weight-bearing** (with moderate impact) and **muscle strengthening** exercise.
- **Muscle strengthening** exercise (at least 2 d/week) should be **progressive**; up to **moderate or high intensity** and targeting all muscle groups, including back muscles.
- **Variety** is important to load the relevant skeletal sites in different directions.
- **Aim to do more, not less.** How to and not don't do!