ENDURANCE PHYSIO
SPORTS & ORTHOPEDIC PHYSICAL THERAPY
WWW.ENDURANCEPHYSIO.NET
406-926-2150

BONE LOADING & BONE HEALTH GUIDE

Bone is living tissue that adapts to load. Strategic loading can build stronger bones and reduce fracture risk across the lifespan.

- Bone mineral density (BMD) peaks in the late teens to early 20s
- After age 40, BMD declines. 10–12% bone loss during menopause, up to 20% loss over 5-7 years post menopause and ~0.5–1.5% loss per year after menopause.
- In the U.S., 1 in 2 women over 50 are at risk for osteoporotic fracture
- Hip fractures are serious:
    - ~25% die within 1 year
    - Mortality risk remains elevated for 1–2 years with subsequent fracture risk increased for 2 years after initial fracture
- Muscle mass declines ~1% per year after 50
- Type II (power) fibers drop from ~60% → 30% and increased fat infiltration in muscle
- Leads to higher fall risk and increased disability
- Loss in muscle mass (sacropenia) + low bone density = high fracture risk
- Most common fracture sites: Vertebral bodies (most common, often underdiagnosed), Distal radius, Hip/proximal femur, Ribs

Screening & Prevention

- **DEXA scan = gold standard for BMD**
- Recommended for women over 65 or at risk

Modifiable Risk Factors	Non-Modifiable Risk Factors
Physical Activity, Nutrition (calcium, protein, Vitamin D), Medication management	Age, Genetics, Sex

Lifespan Approach

Youth & Early Adulthood- Focus: **Build peak bone mass;** Emphasize jumping, sprinting, strength training

Midlife (40s–60s)- Focus: **Maintain bone + build strength;** Prioritize progressive resistance + impact loading, and balance training

Older Adults- Focus: **Fall prevention + maintain bone** Combine: Strength training, Balance training, Safe impact where appropriate

Key Bone Loading Principles

- Bone responds best to **dynamic, high-load, short-duration forces applied quickly**

1. High Strain is Required

- Bone must experience loads greater than daily activity. You need to progressively load beyond baseline
- Fast loading (first ~50 ms) is highly osteogenic

2. Strain Rate Matters

- Fast force application is critical.
- **Do:** Pogos, jumps, explosive lifts
- **Avoid:** Slow, soft loading only

3. Novelty is Required

- Bone stops adapting to repetitive loads. Change exercise, direction, or intensity every **4–12 weeks**

4. Low Volume is Sufficient

- **30–100 quality impact contacts per session.** Focus on quality, not fatigue

5. Bone Adapts Slowly

- Programs must run **6–12 months** minimum
- Consistency > intensity spikes

6. Site-Specific Loading

- Bone adapts only where it is stressed. Train: Lower leg/foot, Femur/hip, Spine/pelvis

7. Multiplanar Loading is Best

- Use varied directions of force. Example: lateral bounds, rotational throws

8. Recovery Matters (Mechanosensitivity)

- Bone needs **4–8 hours between loading bouts**
- Avoid stacking sessions and do NOT perform bone loading immediately after a run

9. Systemic Health Gates Adaptation

- Bone response depends on:
    - Energy availability- RED-S, vitamin deficiency, menopause

10. Integrate with Total Load

- Consider overall stress (running, lifting, life stress)

11. Progress One Variable at a Time

- Increase **height OR volume**, not both simultaneously

Exercise Examples to Target Specific Locations

Spine / Pelvis

- **Strength:** Squats, RDLs, Anti-rotation work
- **Power:** Kettlebell swings or Jump squats

Femoral Neck / Hip

- **Strength:** Single-leg RDLs, Split squats, Step-downs
- **Power:** Cleans, Single-arm snatches, Single leg split hops

Lower Leg / Foot

- **Strength:** Calf raises, Single-leg loading
- **Plyometric / Fast Loading:** Pogos, Drop jumps, Depth jumps, Single-leg hops, Lateral hops

---

Weekly Programming Guide

ENDURANCE PHYSIO
SPORTS & ORTHOPEDIC PHYSICAL THERAPY
WWW.ENDURANCEPHYSIO.NET
408-926-2150

This framework is designed specifically for premenopausal and postmenopausal women, accounting for hormonal influences, bone density changes, and fall risk. Studies have shown that women with osteoporosis desire clear and safe guidance. Team up with a physical therapist to help design a program specifically for you.

Key Weekly Structure

- **Strength Training:** 2–3x/week (essential for both bone and muscle preservation)
- **Balance Training:** Every other day (priority increases postmenopause)
- **Bone Loading (Jump/Hop Training):** 3x/day (morning, midday, evening)-2x/week
    - Follow **30–100 quality contacts per session**
    - Space sessions at least **4–8 hours apart**
    - Mix of:
        - Pogos
        - Single-leg hops
        - Lateral bounds
        - Drop jumps

Programming Considerations

- Progress **one variable at a time** (height, complexity, or volume)
- Rotate exercises every **4–12 weeks** to maintain stimulus
- Coordinate with total training load and recovery
- Ensure adequate **fueling, protein intake, sleep, and Vitamin D**
- Avoid doing bone loading immediately after long runs or heavy fatigue
- Prioritize **quality, speed, and intent** over fatigue

Start early, but it's never too late to improve bone health!

Balance Training

ENDURANCE PHYSIO
SPORTS & ORTHOPEDIC PHYSICAL THERAPY
WWW.ENDURANCEPHYSIO.NET
406-926-2150

Balance training is critical to reduce fall risk and complement bone loading programs. Progress only when the previous level is mastered with good control.

General Dosage: 3–5 days per week, 1-2 sets

Level 1: Narrow Base of Support

- Stand with feet close together
- Eyes open, arms crossed
- **Goal:** Hold >45 seconds

Level 2: Single Leg Stance (Eyes Open)

- Stand on one leg
- Eyes open, arms crossed
- **Goal:** Hold >45 seconds each side

Level 3: Single Leg + Dynamic Gaze

- Stand on one leg, arms crossed
- Move eyes from right side of room → left side of room
- Keep head mostly still, eyes drive movement
- **Goal:** 30–45 seconds with control

Level 4: Single Leg (Eyes Closed)

- Stand on one leg, arms crossed
- Eyes closed
- **Goal:** Hold >30 seconds

Level 5: Uneven Surface Progression

- Stand on one leg on a pillow or unstable surface
- Start eyes open → progress to eyes closed
- **Goal:** 30–45 seconds with control

**** Make it part of your day, do this while you are brushing your teeth****