Bone in the USA

Bone & Joint Health Week

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Department of Health and Exercise Science
Introduction

- Bones adapt using a very simple principle

  Use it or lose it

- Like muscle, bone is modified based on the strain it must withstand.

- Wolff’s Law - BOTH bone loss and gain are related to the mechanical load placed on the tissue.
Bone Growth

- Peak bone mass for both males and females.
- Bone growth phase.
- Decreasing bone mass with age for males and females.
- Bone loss due to menopause for females.
Sex Hormones

- Males Testosterone
- Females Estrogen
Ladies First

- Peak BMD in late 20’s and early 30’s
- Large genetic component
- Oral contraceptive usage
- Menopause
- HRT
Gentlemen

- Large genetic component
- Low T?
- Once you begin taking T, the body will produce less
- 2 million American men have osteoporosis
- Tobacco use is a major risk factor
Bone Disease

- **Osteoporosis**
  - It costs about 17 billion dollars annually (Surgeon General, 2004)
  - 10 million people in US > 50 years of age have osteoporosis
  - 1.5 million fragility fractures per year

- **Lifetime Fracture risk**
  - 1 out of 2 women > 50 years
  - 1 out of 4 men > 50 years
Normal / Osteoporotic Bone

- Decreased bone mass
- Decreased bone density
- Decreased bone quality \(\rightarrow\) Increased fracture risk
Types of Osteoporosis

- **Type I** - postmenopausal
  - high rate of bone turnover in first 5 yrs after menopause, affects spine, 15-35% trabecular bone loss

- **Type II** - age-related bone loss
  - slower rate than Type I, Ca/vit. D deficiencies
  - affects both trabecular and cortical bone, hip fractures
Common Fracture Sites

- Neck of femur fracture
- Greater trochanter
- Fracture between trochanters
- Lesser trochanter
- Fracture below trochanters
- Head of femur

- Vertebral body
- Normal vertebrae
- Vertebral fracture
Risk Factors for Osteoporosis

- Gender
- Race - Caucasian and Asian at greater risk
- Family history - genetics affects peak bone mass
- Age – over 50 years old
- Frame size
- Physical Inactivity
Risk Factors for Osteoporosis

- Tobacco usage and excessive alcohol consumption
- Hypogonadism (low Testosterone or Estrogen)
- Use of certain medications (corticosteroids and anticonvulsants)
- Hyperparathyroidism
- Chemotherapeutics
WHO Criteria for Diagnosis

Dual Energy X-Ray Absorptiometry (DXA)
Auxiliary DXA Scans
Bone Summary

• Bone needs to be stressed to build
• DXA scans are most often used to look at BMD
• Low BMD can result in an increased risk for fracture and osteoporosis
Joints

- When healthy they reduce shock
- Increase stability
- Pain and inflammation free
- Joint space for thick and firm cartilage
Joint Pain

- Nearly 25% of US adults report joint pain and/or arthritis (NIH Survey – 2015)
- Structural damage, past injury, inflammation
- Posture, shoes, gait
- Job (both active and sedentary time)
Low Back Pain

- Chronic low back pain increases with age
- Often due to muscle imbalances
- Flexibility issues
- Postulated to be one the most significant reasons for lost productivity in the work place
- APT
Osteoarthritis

- Most common joint disorder
- Joint space narrows
- Articulating cartilage is damaged

Risk Factors:
- Age
- Sedentary
- Obesity
Cartilage

“Use it and lose it”?
Exercise and Cartilage

- Can lead to injury
- Both animal and human models of research show:
  - Moderate exercise can help cartilage remain firm
  - Promotes cell turnover and replacement
  - Can lead to a thicker pad
  - Even patients with OA have greater cartilage preservation as compared to sedentary patients.
Strategies for Success

- **Diet**
  - How to know where you’re at and where to go?
  - Keeping a food log can **DOUBLE** weight loss goals!

- **Exercise**
  - Before work
  - During Work
  - After Work

- **Checkups**
  - What should I be doing and when?
Dietary Recommendations

- Calcium Intake – 1000mg/day (< 50 yrs)
  – 1200mg/day (50+ yrs) mg (Natl'Osteoporosis Found’)
- Vitamin D Intake - 50+ years need 800-1000 IU/day
- Limit alcohol, caffeine and remove tobacco usage
Diet

- USDA SuperTracker
- Allows you to track everything
- Gives user friendly guidelines
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<td>Protein (g)***</td>
<td>46 g</td>
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<tr>
<td>Protein (% Calories)***</td>
<td>10 - 35% Calories</td>
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<td>Carbohydrate (g)***</td>
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<tr>
<td>Added Sugars</td>
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<td>Total Fat</td>
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<td>5 - 10% Calories</td>
<td>4% Calories</td>
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<tr>
<td>α-Linolenic Acid (% Calories)***</td>
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<td>Selenium</td>
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<td>700 μg RAE</td>
<td>3605 μg RAE</td>
<td>Over</td>
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My Fitness Pal

- Easy to use FREE app
- Use your phone to scan barcodes
- No more trying to find a substitute item or meal
PA Recommendations

- 10,000 steps per day

150min of moderate **OR** 75min of vigorous PA / week

PLUS

2 days / week of resistance training
Types of Exercise

- Structured
- Unstructured
- Before work
- During Work
- After Work
Unstructured Exercise Opportunities

- **Before work**: parking, transportation
- **During work**: Get up and move (phone reminders), standing desk, exercise ball, stairs, face to face instead of an email, 10 body squats with 10 jumping jacks.
Unstructured Exercise Opportunities

- **After work** - get a pet.
  
  Walk your kids to practice.
  
  Pack a dinner and walk to the park.

These fun and easy activities don’t have to take a lot of time but can really add up!
Structured Exercise Before & After Work

- Gold’s, Steel Fitness, Koda Crossfit open at 5am
  Athletic Loft (24hrs)

- Walk to work
- Park further away
- Ride your bike to work
- Take the stairs
Structured On Campus Exercise

- Sarkeys Fitness Center
  - Malinda Williams  mdwilliams@ou.edu
  - Open 6am – midnight
  - Exercise Equipment, pool, racquetball, tennis and basketball courts, weight room and cardio room
  - Climbing wall, Outdoor Pursuits Program
  - Massage Therapy, Intramurals, Fitness classes
  - Personal Training, Boot Camps, Fitness Assessments
  - $10/month, direct withdrawal
Types of Exercises to Help

- Bones and cartilage need to be stressed
  - Quick not long duration
  - Dynamic not static
  - Multi-directional
  - Be creative

Play like your kids and you will get a WORKOUT!
Physical Activity Trackers

- FitBit
- Pedometers (10,000 steps)
- AppleWatch
- Heart Rate monitors

- Both My Fitness Pal and SuperTracker also have PA inputs and interactive coaches that help you reach your daily goals.
Get Involved

- Lots of resources available to you on campus
  - Group fitness classes
  - Personal trainers
  - Research participants
Summary

- Exercise is good for prevention and treatment of bone and joint pain.
- Short, intense, and dynamic movements ARE enough.
- Use your on campus resources.
- Be creative off campus, to increase PA and seize opportunities to do bone loading activities.
- Be mindful of your health including nutritional factors.
- Don’t skip your checkups.
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