



Improving People's Lives Through Innovations in Personalized Health Care

Modernizing Our Approach to Skeletal Health


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DISCLOSURES

- Jackie Buell
 - Employer: Ohio State University
 - Stock/Shareholder in family
 - Abbott




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LEARNING objectives

By the end of the session, participants should be able to:

- Identify the qualities of exercise that promote bone health.
- Explain the role of body weight as it relates to bone health.
- List the primary drivers of a diet that promotes bone health.



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Position Paper | [Open Access](#) | Published: 08 February 2016

The National Osteoporosis Foundation's position statement on peak bone mass development and lifestyle factors: a systematic review and implementation recommendations

C. M. Weaver, C. M. Gordon, K. F. Janz, H. J. Kalkwarf, J. M. Lappe, B. Lewis, M. O'Karma, T. C. Wallace & B. S. Zemel

Osteoporosis International 27, 1281–1386 (2016) | [Cite this article](#)

Endorsed by


- American Bone Health
- American College of Sports Medicine
- Endocrine Society
- National Osteoporosis Foundation
- Society for Women's Health Research

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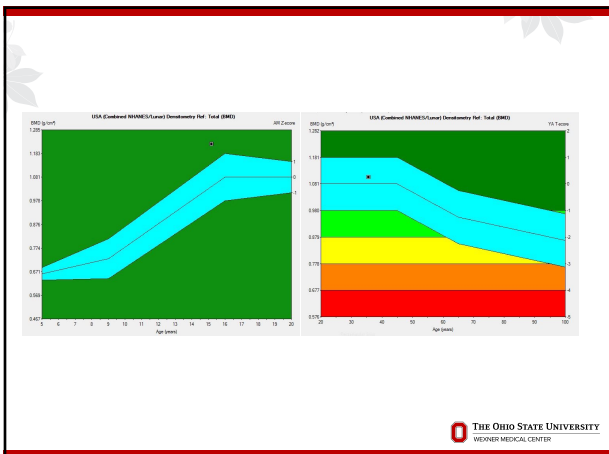
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Differing definitions Depending on Age

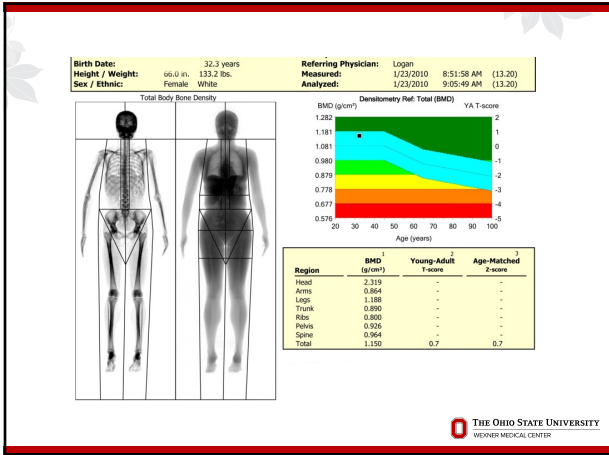
- WHO BMD ≤ -2.5 T-score, young adult comparison
 - -1 to -2.5 is osteopenia or low bone mass
- ISCD
 - Same as WHO for those over age 50
 - Younger than 50 or pre-menopausal, use Z-score and less than -2.0 is "below the expected bone mass for age"
- NOF/IOF Clinical Guidelines
 - Unique programs: BoneFit USA, Healthy Bones resources for practitioners and patients

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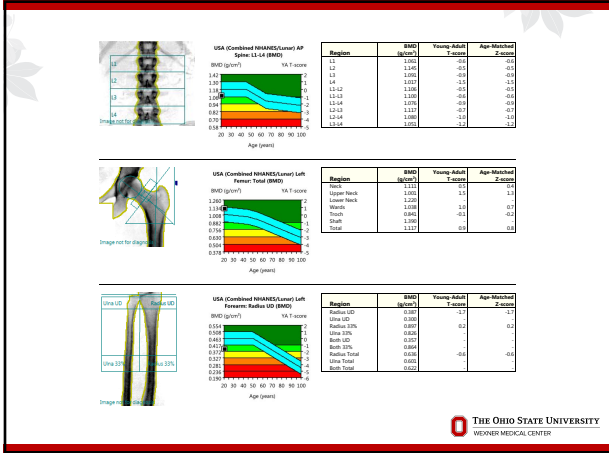
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Exercise and bone health

- Wolff's Law: Bone responds to stress
 - Dr. Harold Frost and mechanostat theory
 - Utah paradigm built on that for years
- Weight bearing is necessary but is all weight bearing the same?

MES

Fracture 25,000

p >3000 µε

≈ 1000 µε

ε 50-100 µε

MES: minimal effective strain (measured in units of microstrain or µε)

Bone Response

fracture

woven bone

modeling

maintenance

disuse remodeling

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Beck's work and advocacy

- Learn more about her work Google Belinda Beck Bone Clinic, comes up Australia
- LIFTMOR trial
 - Women over 60 yo, already poor to very poor bone mass, progressive HiRIT
 - Professionally supervised
- MEDEX-OP
 - Contribution of anti-resorptive meds

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LIFTMOR exercises

- Deadlifts
 - Overhead press
 - Back squats
 - Jumping chin-ups with drop landings
- 85% 1 RM

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Recommendations

- Optimize bone health- impact loading
 - Dynamic, not static
 - High bone strains
 - Applied rapidly
 - Diversification of activities
- More than 2x body weight- progressive, novel and multi-directional
 - 10-150 impacts/day, 3x/week
- Never too late to start! But younger is better

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Progressive resistance training (PRT)

- 8 exercises per session targeting large muscle groups
 - 80-85% 1 RM, ≥ 16 RPE
 - 2 days per week, 2-3 sets of 8 reps
- Consider rapid PRT for muscle power

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BALANCE training

- More focus as higher risk for fracture
- 4 sessions per week with 30 mins exercise
- Single leg, walk up and back and sideways, figure 8 walks, obstacle course, change surface to foam mat, heel and toe walks, dual tasking for cognitive
- Tasks performed with closed eyes, always safe with supervision

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Body weight

- Higher risk in thin individuals
- Lean mass, fat mass, or total body weight
- Impact of weight loss
 - Potential impact of weight gain but biased
- Statistical control for weight

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Other factors

- Nutrition
- Hormonal status
 - Estrogen
 - Testosterone

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The Female Athlete Triad (1993→2007)

Medicine & Science in Sports & Exercise: October 2007 -
Volume 39 - Issue 10 - p 1867-1882
doi: 10.1249/mss.0b013e318149f111

https://journals.lww.com/acsm-mssse/Fulltext/2007/10000/The_Female_Athlete_Triad_26.aspx

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The Male Athlete Triad—A Consensus Statement From the Female and Male Athlete Triad Coalition Part 1: Definition and Scientific Basis

Nattiv, Aurelia; De Souza, Mary Jane; Koltun, Kristen J.;
Misra, Madhusmita; Kussman, Andrea; Williams, Nancy I.;
Barrack, Michelle T.; Kraus, Emily; Joy, Elizabeth;
Fredericson, Michael
Clinical Journal of Sport Medicine 31(4):335-348, July 2021.
doi: 10.1097/JSM.0000000000000946

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RED-s includes the TRIADs (2014)

The IOC consensus statement: beyond the Female Athlete Triad—Relative Energy Deficiency in Sport (RED-S)

Margo Mountjoy,¹ Jorunn Sundgot-Borgen,² Louise Burke,³ Susan Carter,⁴ Naama Constantini,⁵ Constance Lebrun,⁶ Nanna Meyer,⁷ Roberta Sherman,⁸ Kathrin Steffen,^{2,9} Richard Budgett,⁹ Arne Ljungqvist⁹

<https://bjsm.bmj.com/content/48/7/491>



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Nutrition

- Energy

- Macronutrients
 - Protein
 - Carbohydrate
 - Fat
 - Alcohol

- Micronutrients
 - Vitamin D, Calcium
 - Mg, Fe, Cu, P, Fl, Mn, K



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Other possible Nutritional factors

- Omega-3's
- Vitamin K
- Folate, B₁₂
- Zinc
- Isoflavones
- Anti-oxidant compounds
 - [Cissus Quadrangularis?](#)
- Boron, strontium



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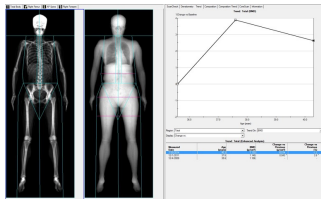
Eating patterns

- Mediterranean Diet
- Western Diet or Standard American Diet
- Veganism

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Case study 1

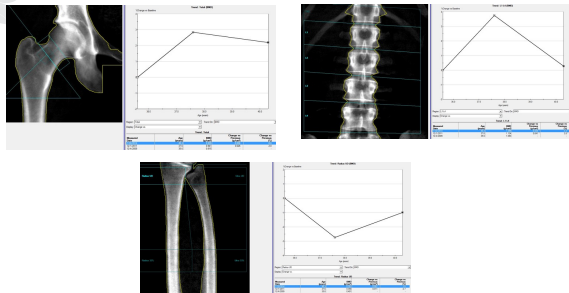
- Female runner with crazy lifestyle issues



36 yo mother of 5,
lot of mileage and lot of wine

| Site | YA | AM |
|-------------|------|------|
| Total Body | 0.2 | 0.2 |
| Hip | -0.7 | -0.3 |
| Neck | -0.3 | 0.3 |
| L-spine 1-4 | -0.7 | -0.3 |
| RUD | -1.4 | -1.4 |

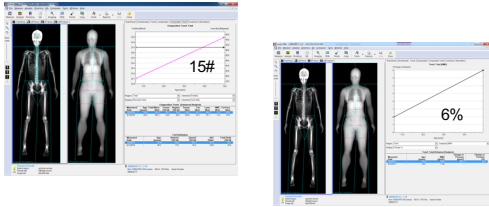
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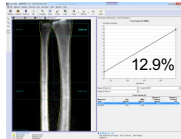
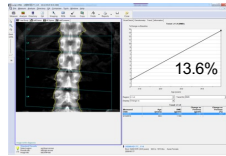
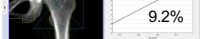
Case Study 2

- Female Runner with unknown thyroid issues



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Case Study 3

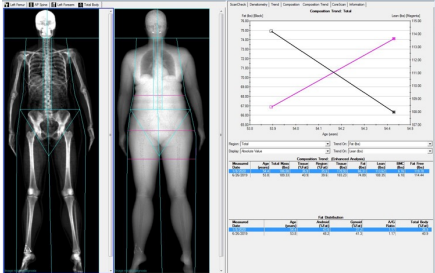
- Male triathlete with no idea how much he should eat

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Case Study 4

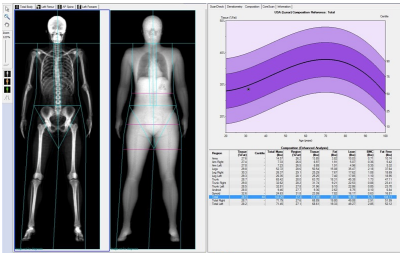
- Female fitness enthusiast frustrated with lack of weight loss



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Case Study 5

- Trans female, 5'7" tall, 27.3% regional body fat, 104.1 FFM



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OTHER Interesting DXA situations

- Para-athlete preparing for road race
- Reference population differences
- Breast augmentation
- Penile augmentation
- Body jewelry

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Practice applications

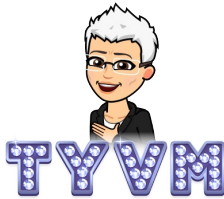
- The impact of exercise makes the difference
- Don't worry as much about the scales as the muscle mass
- Quality eating of whole foods to cover bone health

- Affordable DXA in clinical practice makes a big difference for clients and their goals

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THE BEST WAY TO PREDICT THE
FUTURE IS TO CREATE IT.

— Abraham Lincoln



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