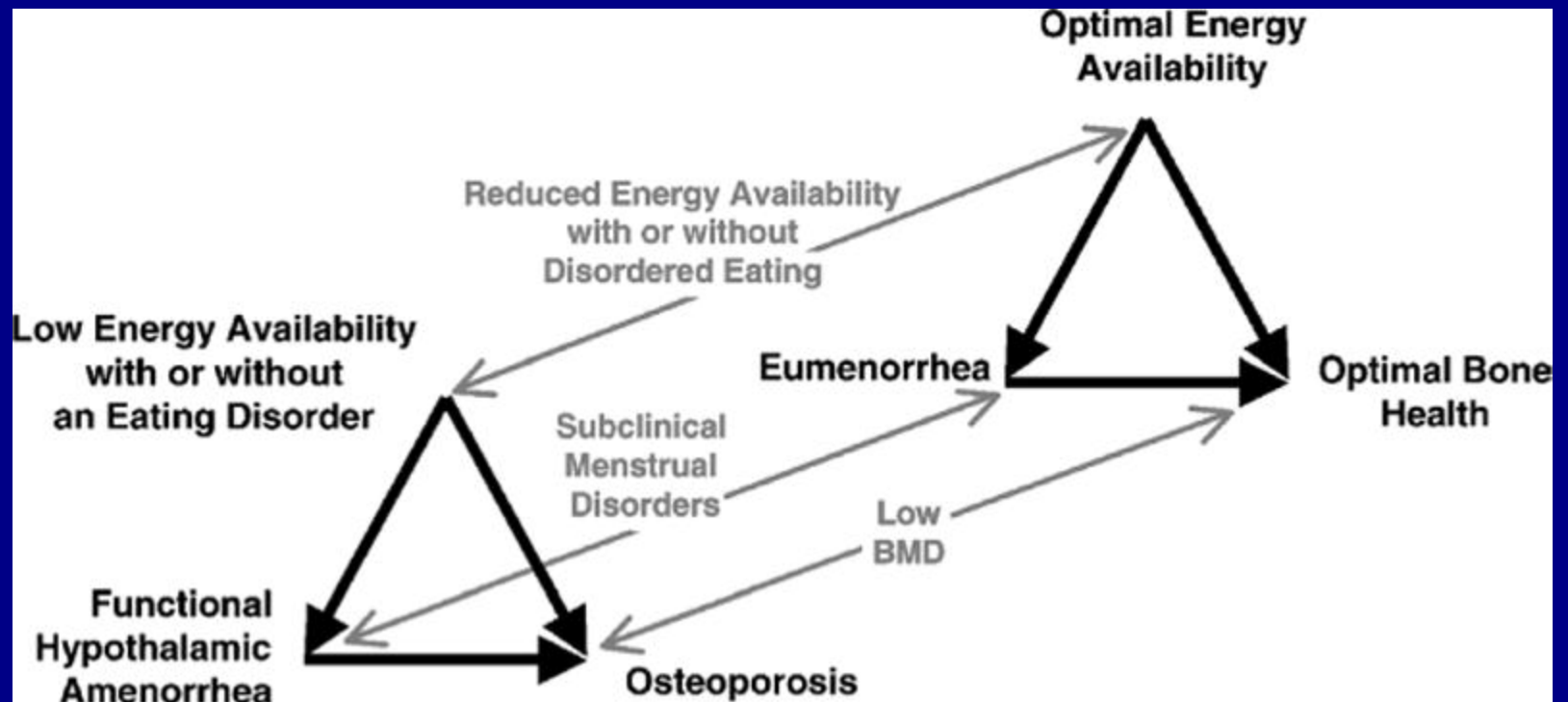


Female Athlete Triad

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Female Athlete Triad





Prevalence of Components of the Triad

- 15 to 62% of female college athletes have disordered eating.
- 3.4 to 66% of female athletes are amenorrheic.
- 20-50% of female athletes have osteopenia using WHO criteria.

Estrogen Replacement in Adult Amenorrheic Athletes

- Common practice
 - 92% of sports medicine specialists and family physicians supported OCP use to increase BMD*
- Data limitations
 - Studies of efficacy of OCPs not definitive
 - ↑, no change, ↓ in BMD
 - Often small
 - Many do not control for weight changes

**Need for definitive studies assessing efficacy
of estrogen in ↑ BMD**

**SEEKING FEMALE ATHLETES 14-21 YEARS
OLD NOT GETTING MENSES
*FOR A RESEARCH STUDY***

**INCLUDES BONE DENSITY TESTING,
NUTRITIONAL AND HORMONAL
EVALUATION.**

- **1 YEAR LONG STUDY**
- **3-6 OUTPATIENT VISITS**
- **POSSIBLY 2 INPATIENT VISITS**
- **MEDICAL HISTORY AND QUESTIONNAIRE**
- **A NATURAL HORMONE MAY BE ADMINISTERED**

UP TO \$ 525/- STIPEND

CALL DR. MADHU MISRA AT 617-724-5602

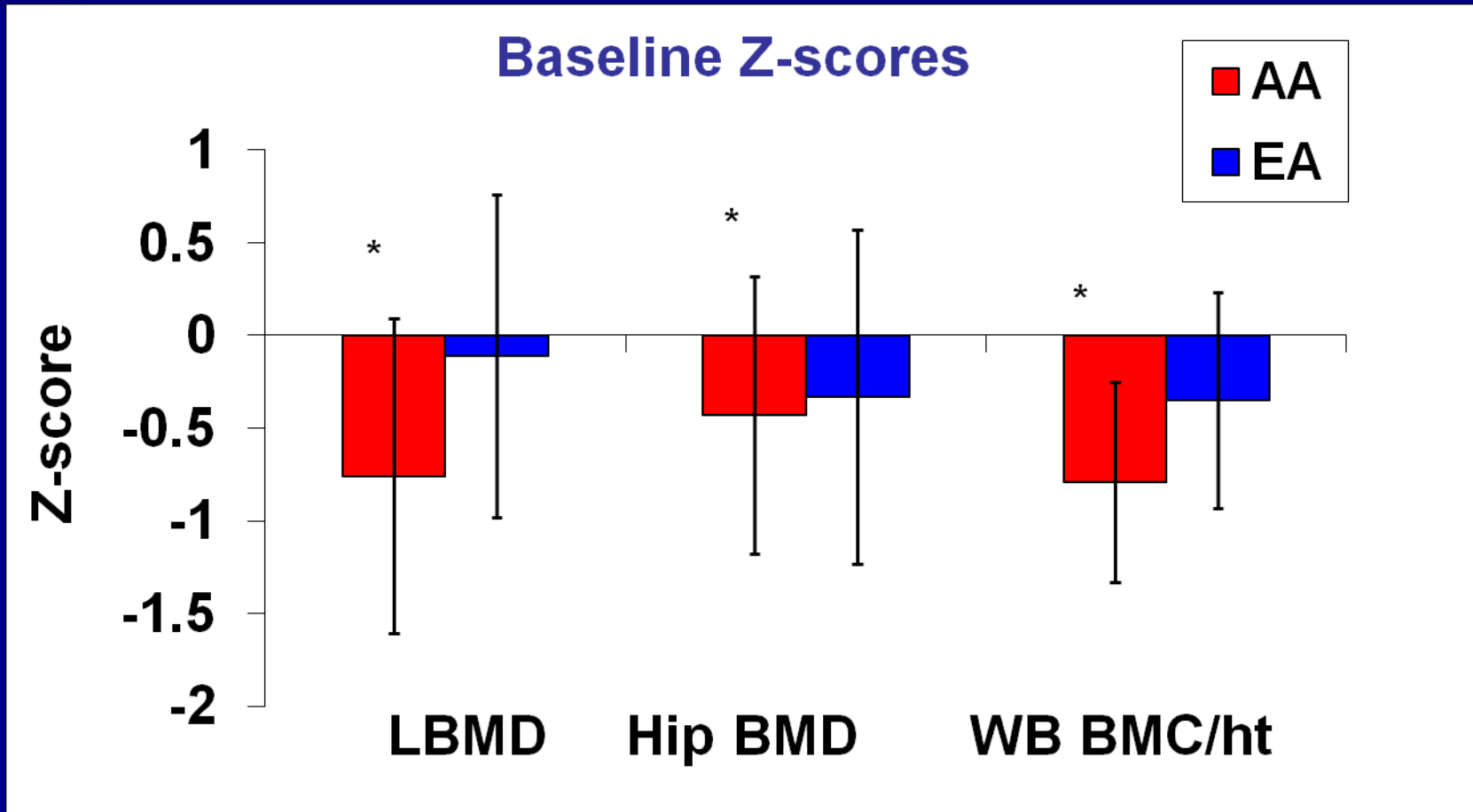
NEUROENDOCRINE UNIT

MASSACHUSETTS GENERAL HOSPITAL

Study Info

- Clinical assessment (H/P)
- Labs: CBC, hormones, markers of bone formation and resorption
- Bouchard activity record, EDI-2, TFEQ, caloric intake
- Bone age x-ray
- BMD and Body composition (DXA)
- Bone microarchitecture (X-treme CT)
- Resting energy expenditure, VO₂ max, handgrip strength

Amenorrheic athletes (n=21) vs. Eumenorrheic athletes (n=18) ages 12-18y



AA

EA

Total Lean Mass

**Positively
predicted:**

1. LBMAD
2. Hip BMD
3. WB BMC/ht

**Positively
predicted:**

1. Hip BMD
2. Hip BMD Z
3. WB BMC/ht
4. WB BMC/ht Z

Total Fat Mass

*Not an independent
predictor

**Positively
predicted:**

1. LBMAD
2. LBMAD Z

Percent Trunk Fat

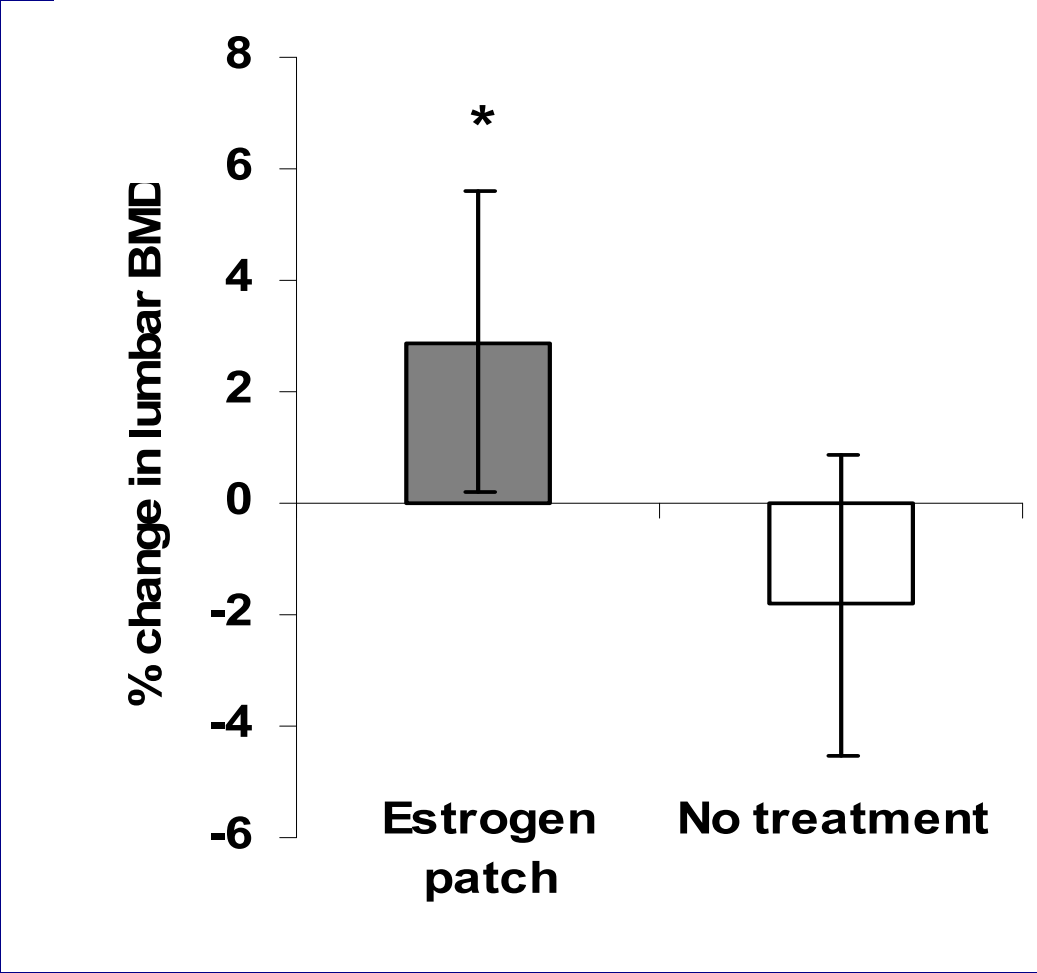
**Negatively
predicted:**

1. LBMAD
2. LBMAD Z
3. WB BMC/ht
4. WB BMC/ht Z

**Negatively
predicted:**

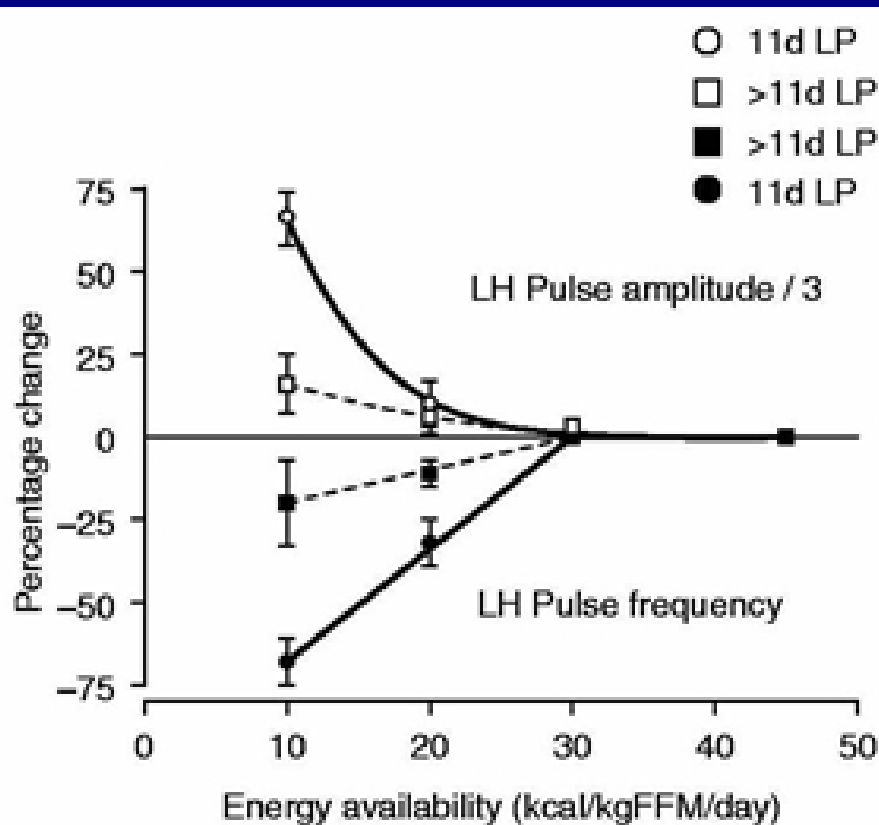
1. LBMAD
2. LBMAD Z

Effects of transdermal estradiol (n=6) or no treatment (n=6) on BMD measures in girls with hypothalamic amenorrhea 14-18 years old over a 12-month period



Preliminary data

Dose-response relationship between energy availability and LH pulsatility



Energy Availability (EA):

Dietary energy intake (EI) - Exercise energy expenditure (EEE) normalized to fat-free mass (FFM): $EA = (EI - EEE) / FFM$

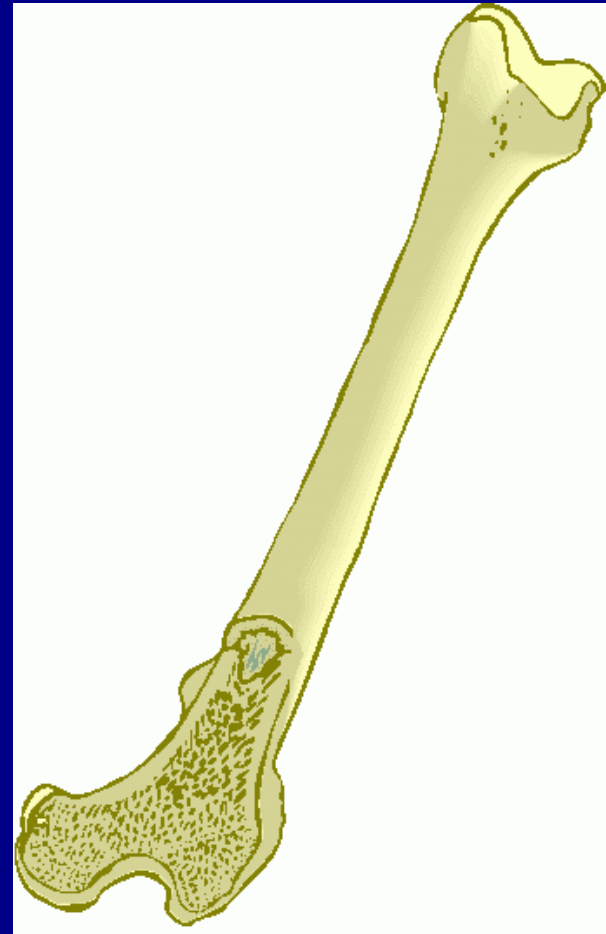
Ex. EI = 2000 kcal/d,
EEE = 600 kcal/d, FFM = 51 kg
 $(2000 - 600) / 51 = 27.5$
kcal/kg of FFM/d

Interrelationship of Components of the Triad

- ***Negative Energy Balance*** → **Disruption of Hypothalamic-Pituitary-Ovarian (HPO) axis**
- **Low energy availability alters levels of metabolic hormones:**
 - Increase in fasting PYY, ghrelin, cortisol, and GH concentrations in the Triad
 - Decrease in FSH, LH, estradiol, insulin, glucose, insulin-like growth factor-1 (IGF-1), 3,3,5-triiodothyronine (T₃) and leptin.

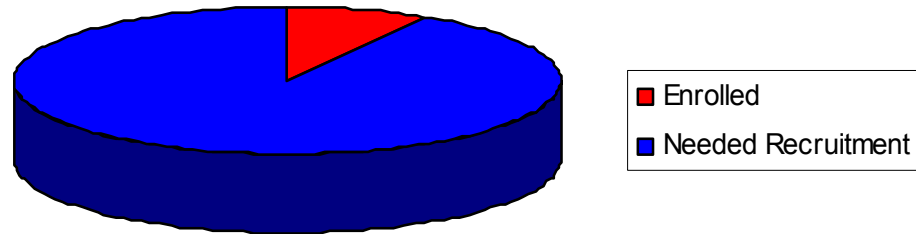
Interrelationship of Components of the Triad

- Estradiol
- Progesterone
- Cortisol
- Growth Hormone
- T3
- IGF-1
- PYY
- PTH
- Calcium
- Vitamin D
- Calcitonin
- Other Cytokines

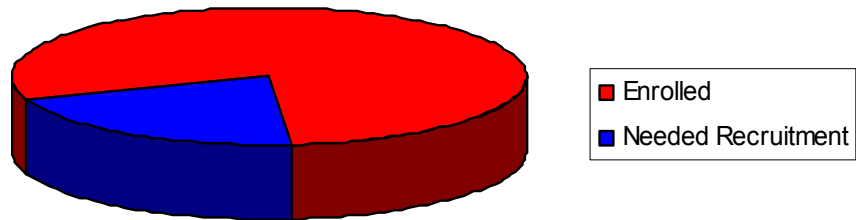


Current Enrollment

AA



EA



HC

