



Il metabolismo osseo nell'anoressia nervosa

Fabio Vescini



Agenda

- Meccanismi fisiopatologici della perdita di massa ossea nell'anoressia
- Densità minerale ossea (BMD) nell'anoressia e rischio di frattura
- Metodiche di misurazione della BMD
- Strategie terapeutiche per il recupero della BMD

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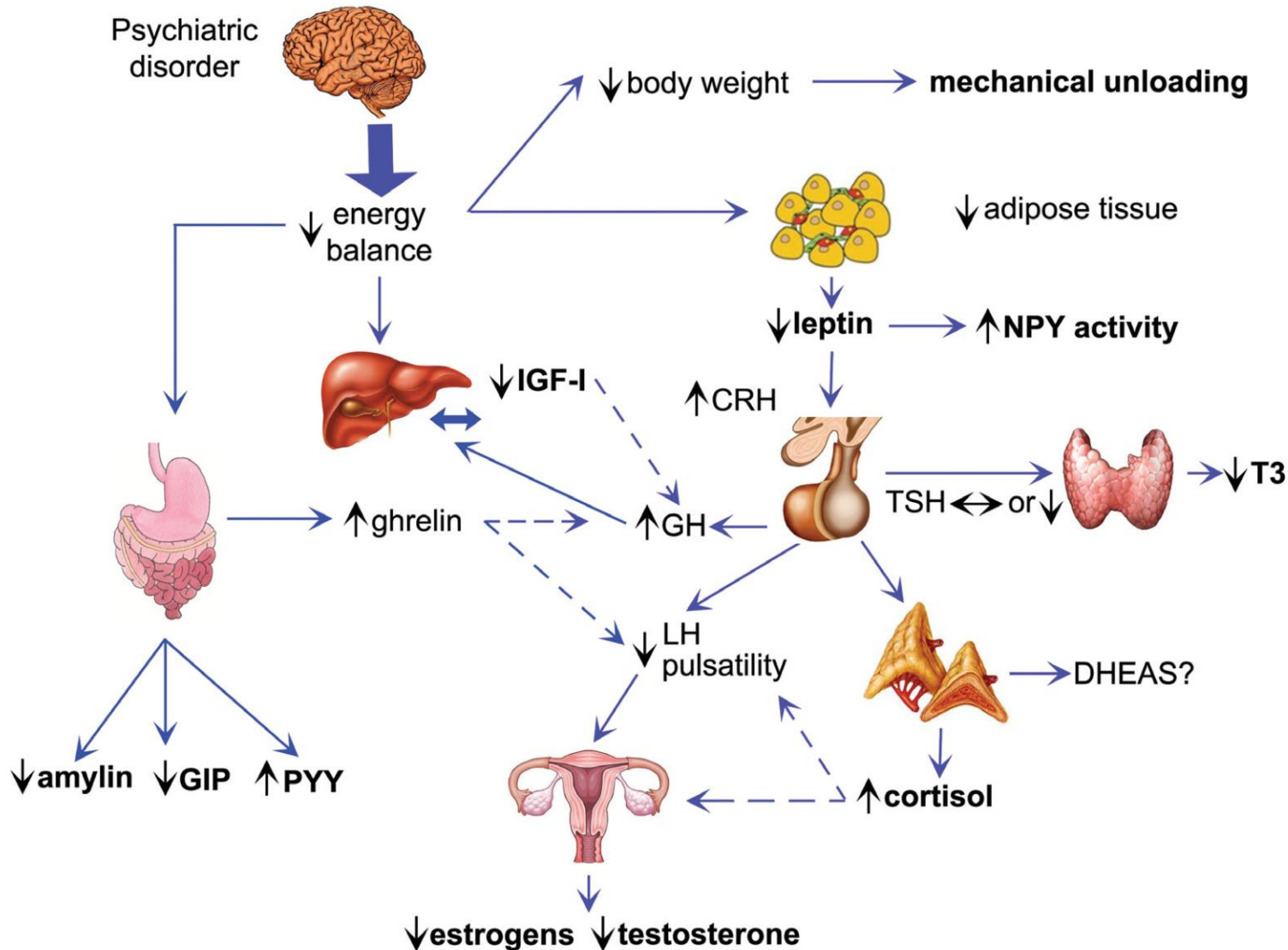
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Bone disease in anorexia nervosa

Anastasia D. Dede,¹ George P. Lyritis,² Symeon Tournis³



HORMONES
2014, 13(1):38-56

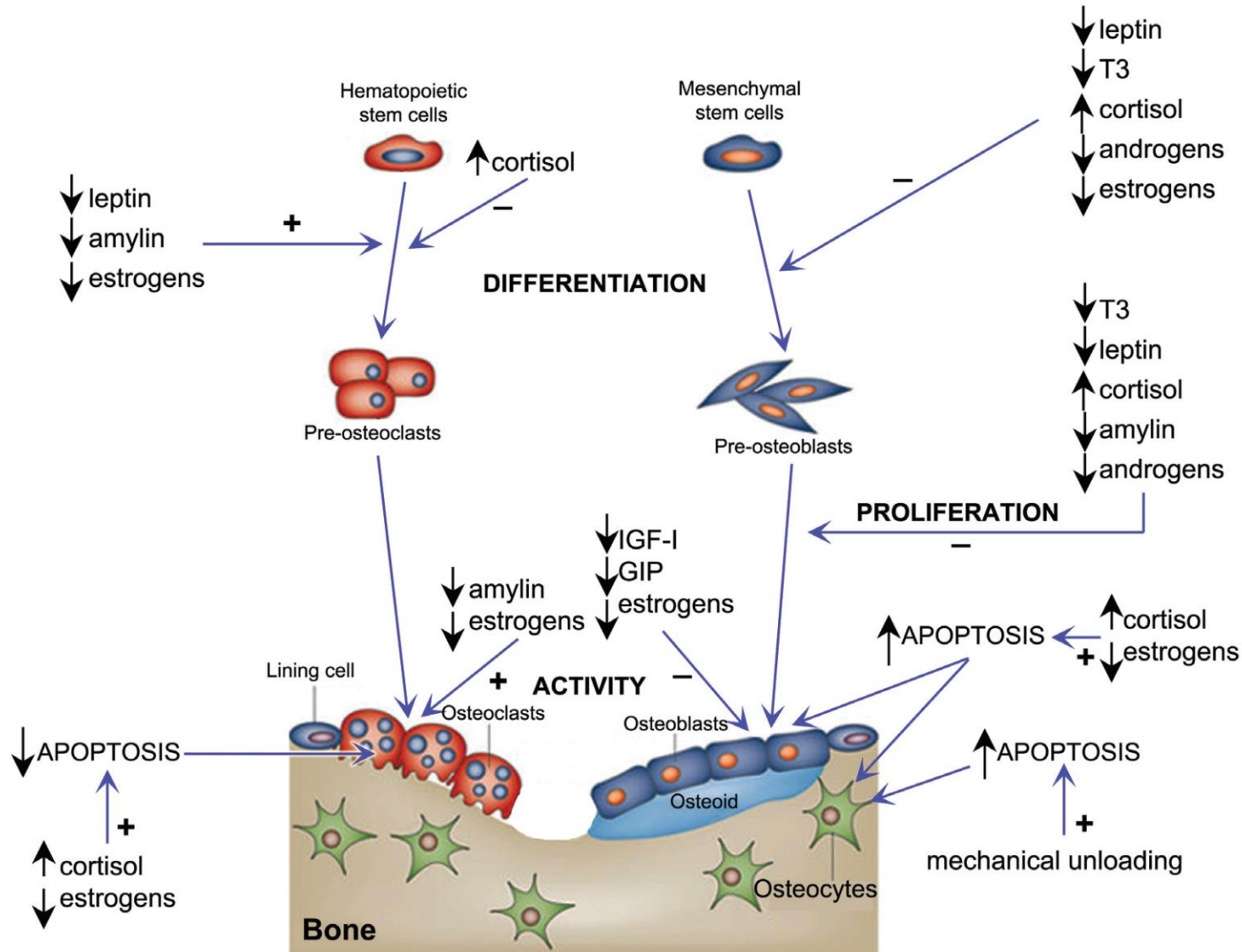


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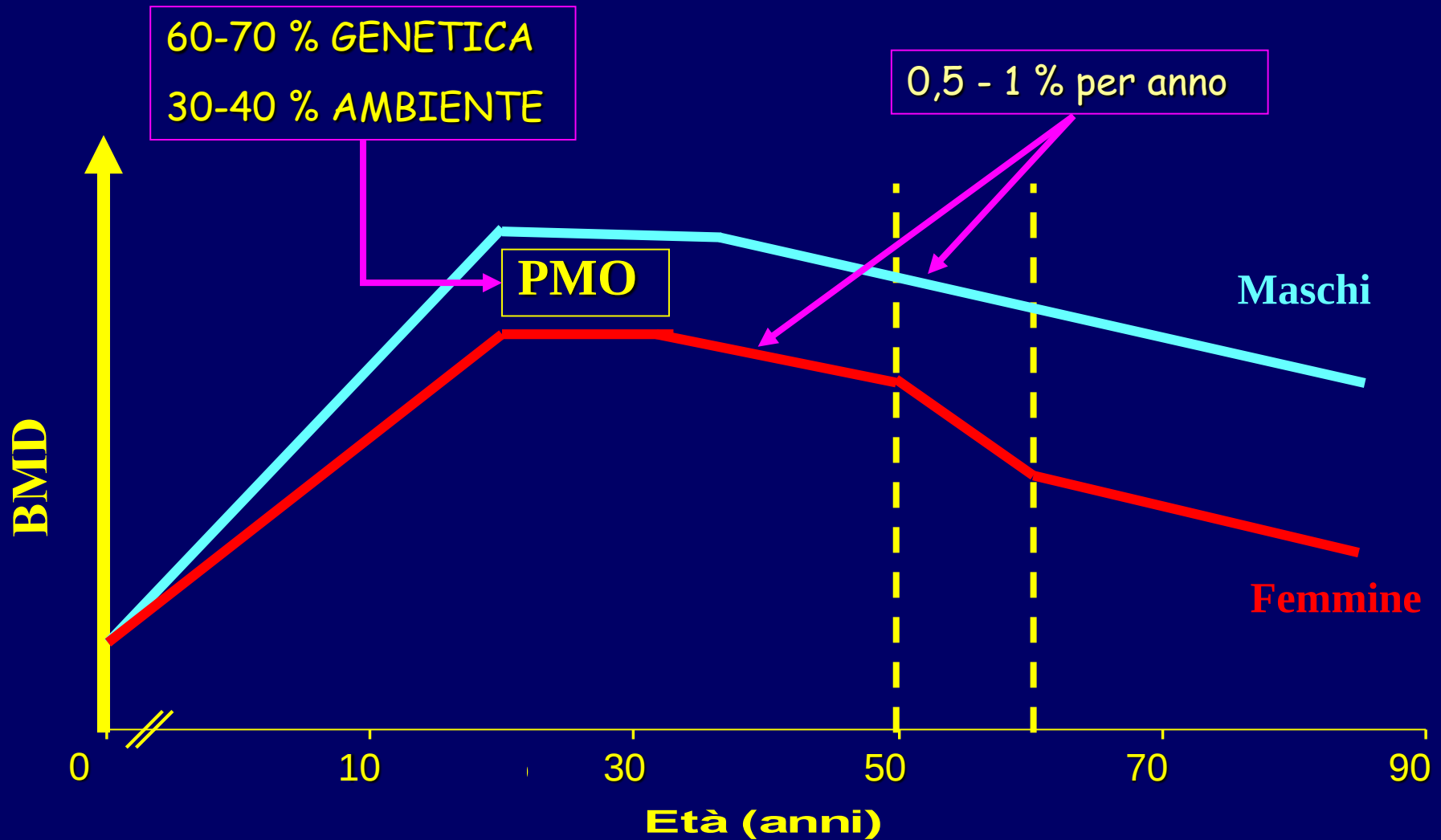
HORMONES
2014, 13(1):38-56



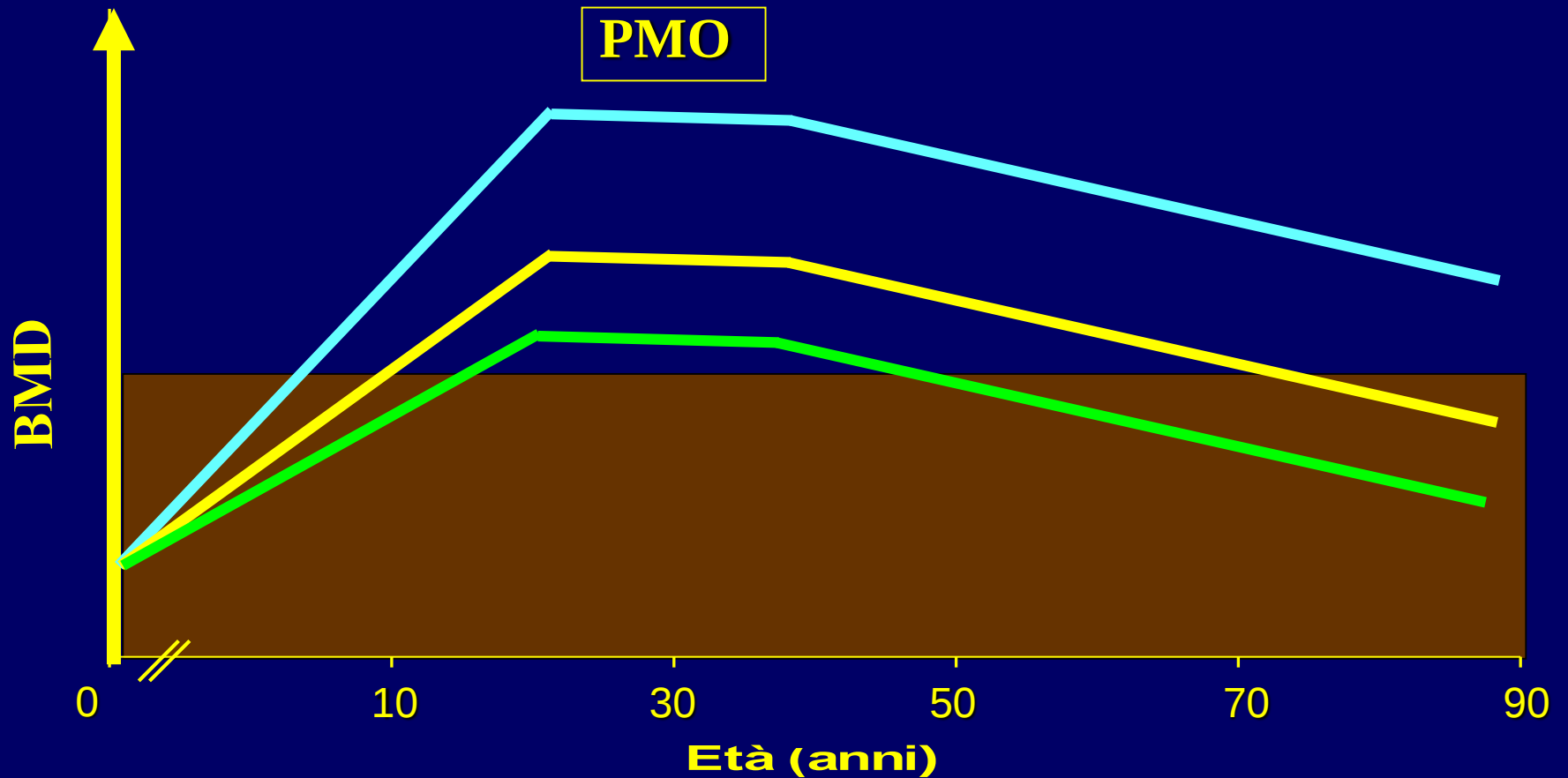
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Andamento fisiologico BMD



Importanza del picco di massa ossea (PMO)

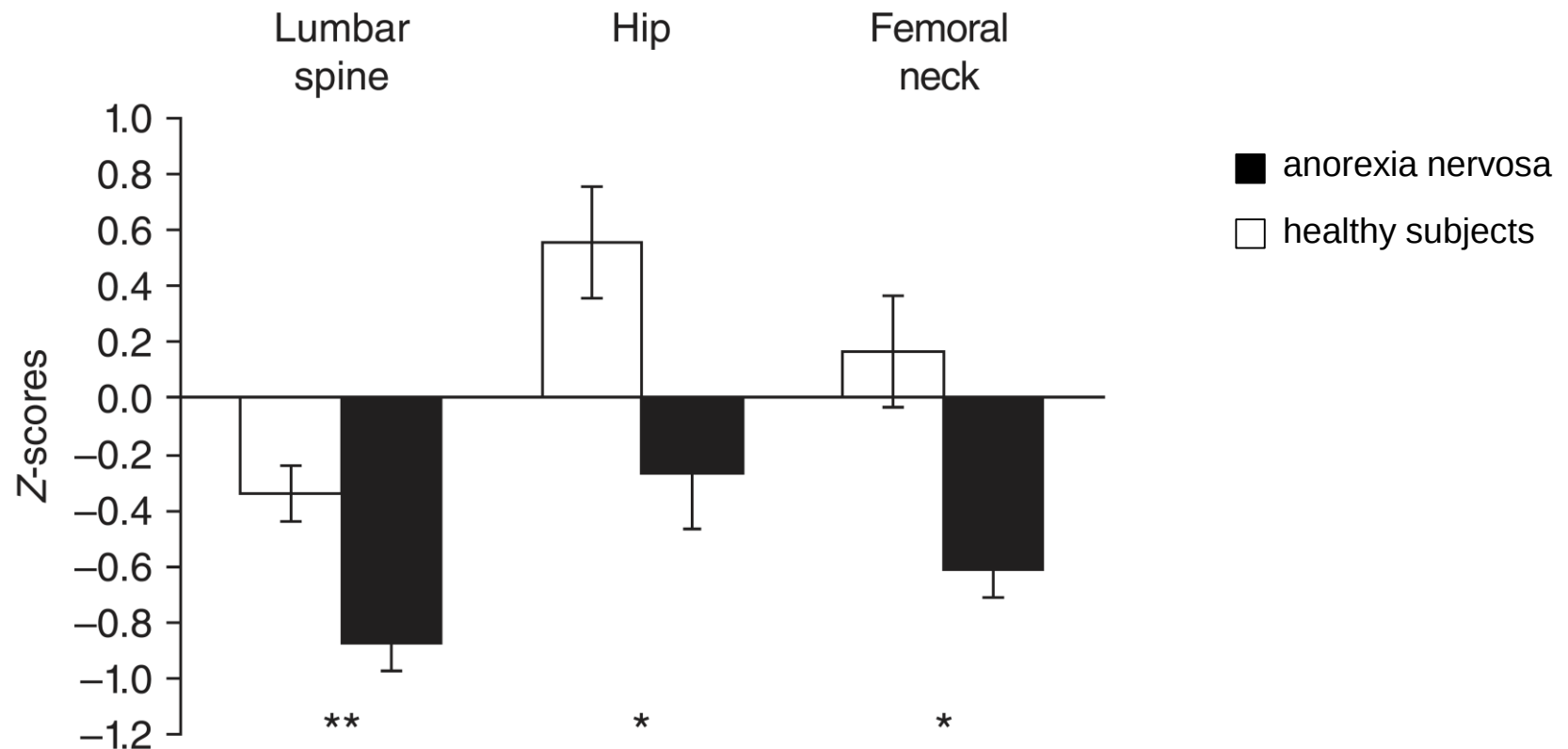




Anorexia nervosa and bone

Madhusmita Misra^{1,2} and Anne Klibanski¹

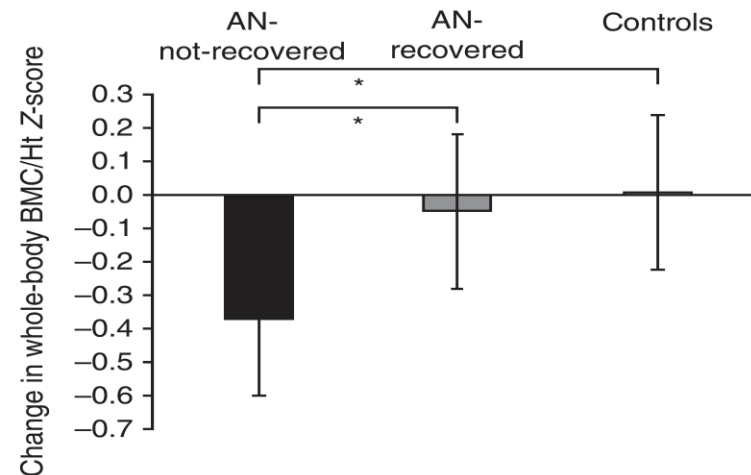
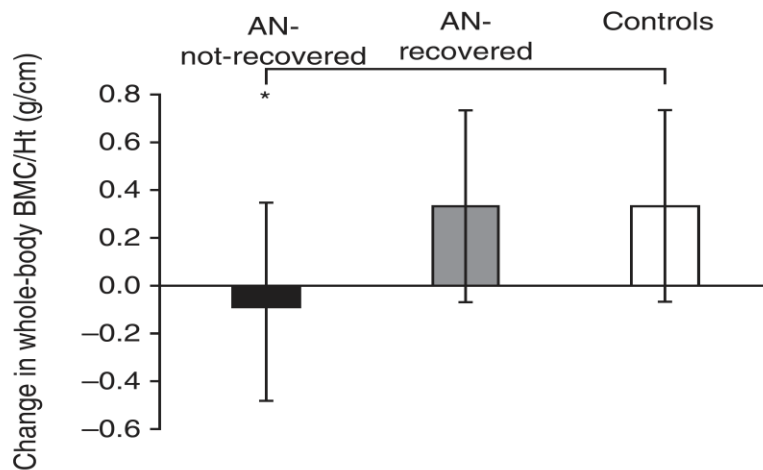
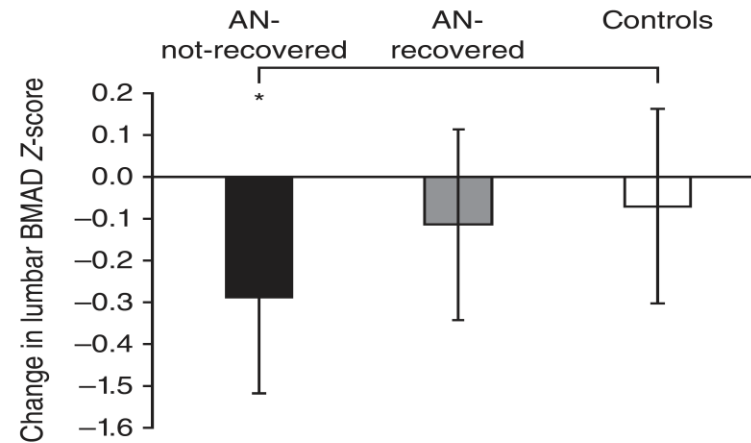
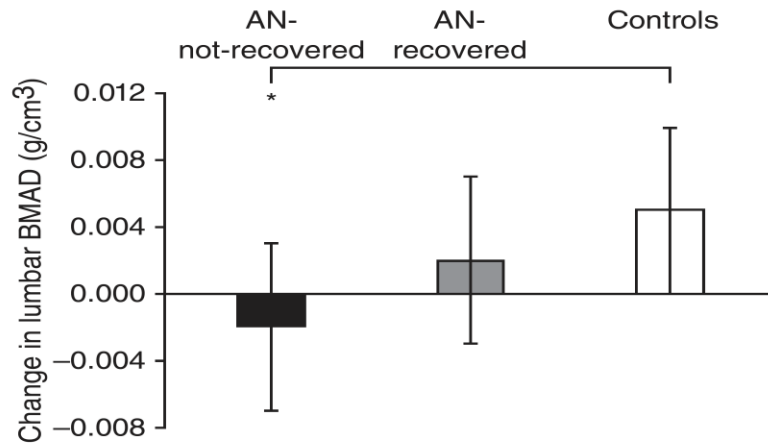
Z-scores bone mineral densities in girls with anorexia nervosa and healthy control subjects





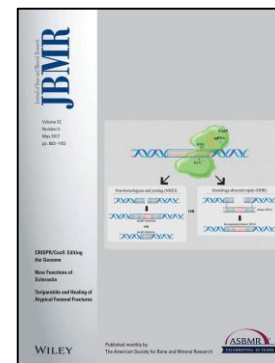
Anorexia nervosa and bone

Madhusmita Misra^{1,2} and Anne Klibanski¹



Assessment of Sex Differences in Fracture Risk Among Patients With Anorexia Nervosa: A Population-Based Cohort Study Using The Health Improvement Network

Jason M Nagata,¹ Neville H Golden,¹ Mary B Leonard,¹ Lawrence Copelovitch,² and Michelle R Denburg²



J Bone Miner Res.
2017;32(5):1082-1089

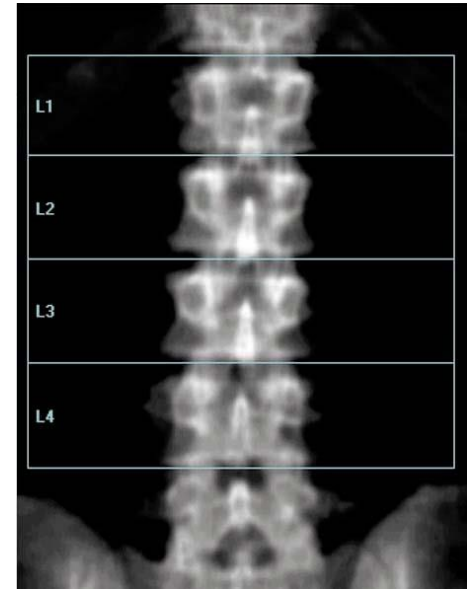
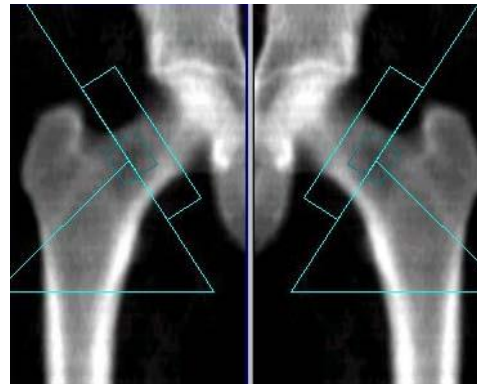
Table 3. Age-Adjusted HR for Fracture Associated With AN in Females Versus Males

Site	Number of events		Females		Males	
	Females	Males	HR (95% CI)	<i>p</i>	HR (95% CI)	<i>p</i>
Vertebra	98	5	2.19 (1.30–3.69)	0.003	7.25 (1.21–43.45)	0.03
Skull/face	139	36	2.15 (1.39–3.34)	0.001	0.30 (0.04–2.18)	0.23
Pelvis	46	1	4.54 (2.42–8.50)	<0.001	—	—
Rib/thorax	130	15	2.87 (1.89–4.36)	<0.001	1.67 (0.38–7.42)	0.50
Clavicle/scapula	114	34	2.20 (1.36–3.57)	0.001	0.32 (0.04–2.32)	0.26
Humerus/elbow	244	17	2.17 (1.56–3.02)	<0.001	1.39 (0.32–6.10)	0.66
Forearm/wrist	736	46	1.49 (1.19–1.85)	<0.001	0.74 (0.23–2.40)	0.62
Hand	657	124	1.40 (1.11–1.78)	0.005	0.73 (0.35–1.49)	0.38
Hip/femur	72	7	5.59 (3.44–9.09)	<0.001	1.89 (0.23–15.74)	0.56
Lower leg/ankle	554	48	1.28 (0.98–1.68)	0.07	0.71 (0.22–2.28)	0.57
Foot	714	62	1.36 (1.08–1.71)	0.008	1.81 (0.89–3.67)	0.10
Multiple sites	11	1	3.89 (1.03–14.67)	0.045	—	—
Not specified	723	57	1.91 (1.56–2.33)	<0.001	1.26 (0.54–2.94)	0.59
Overall	3589	373	1.59 (1.45–1.75)	<0.001	1.05 (0.74–1.49)	0.80

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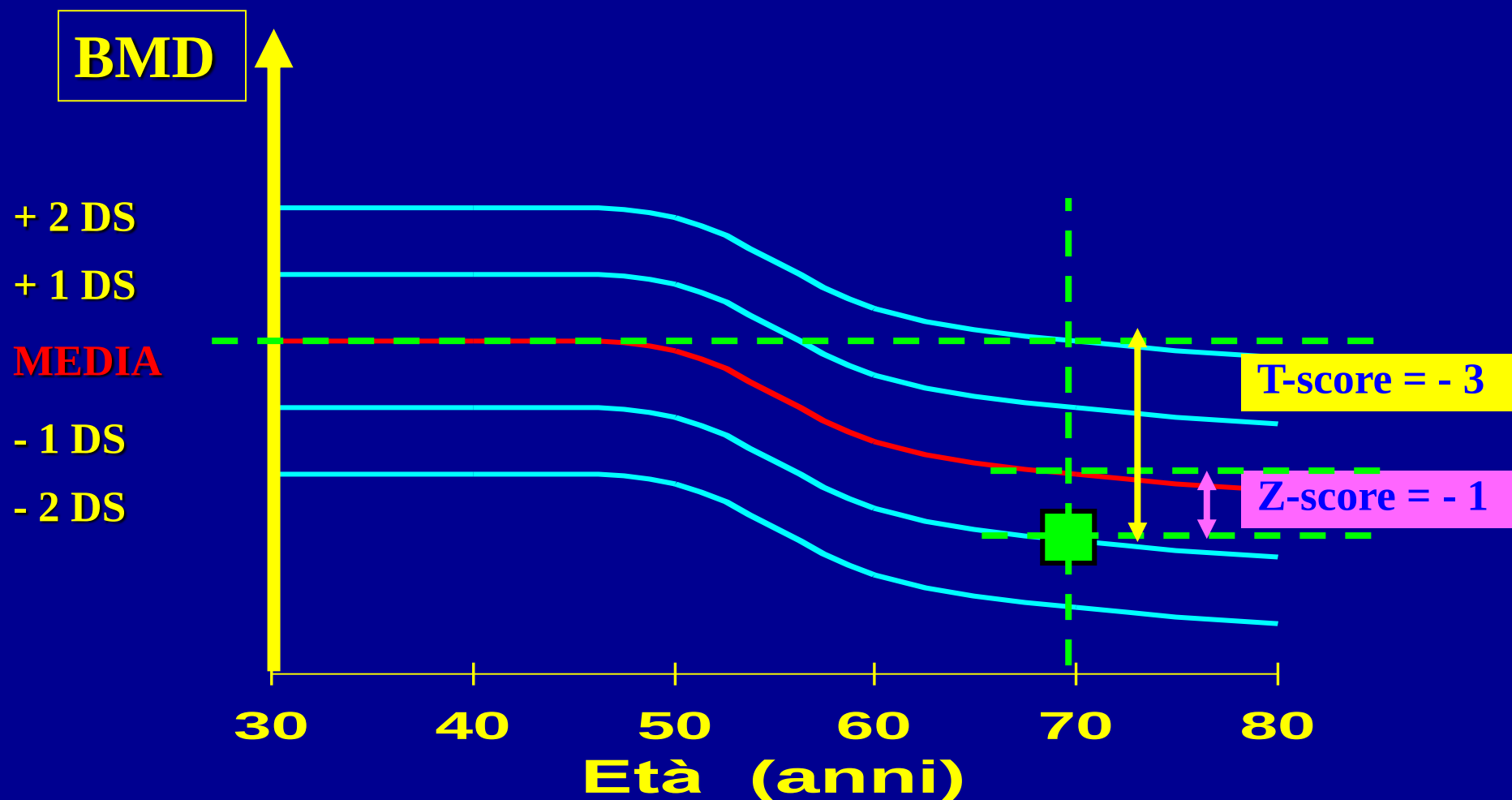
Standard Clinical Assessment of Bone Mineral Density (BMD)



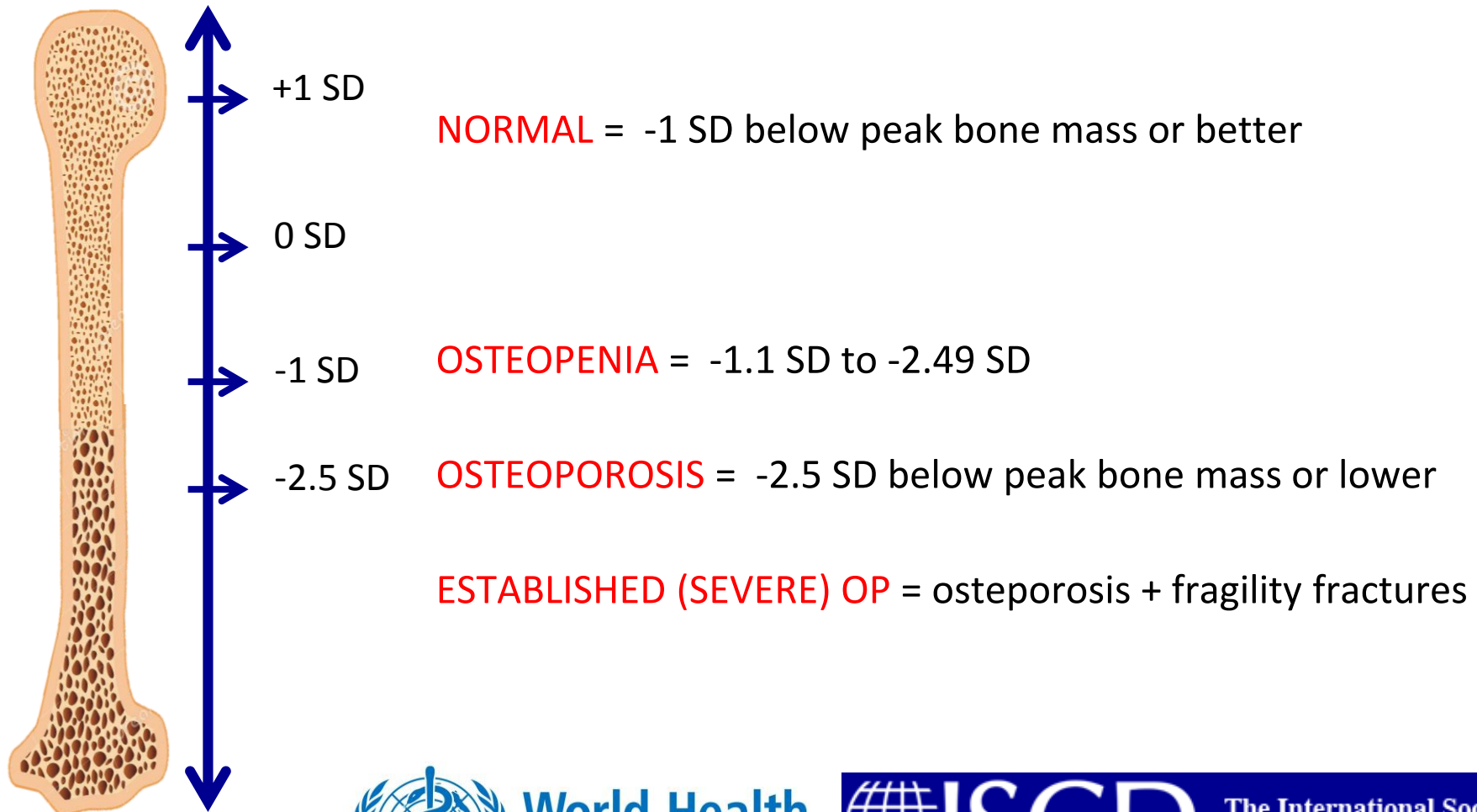
BMC = Bone Mineral Content (grams)
Area (cm²)

$$\text{BMD (g/cm}^2\text{)} = \frac{\text{BMC}}{\text{Area}}$$

Calcolo del T- e dello Z-score



Diagnosis by T-score



World Health
Organization



ISCD

The International Society
For Clinical Densitometry

Executive Summary of the 2019 ISCD Position Development Conference on Monitoring Treatment, DXA Cross-calibration and Least Significant Change, Spinal Cord Injury, Periprosthetic and Orthopedic Bone Health, Transgender Medicine, and Pediatrics

Christopher R. Shuhart,^{1,} Swan Sim Yeap,² Paul A. Anderson,³ Lawrence G. Jankowski,⁴ E. Michael Lewiecki,⁵ Leslie R. Morse,⁶ Harold N. Rosen,⁷ David R. Weber,⁸ Babette S. Zemel,⁹ and John A. Shepherd¹⁰*



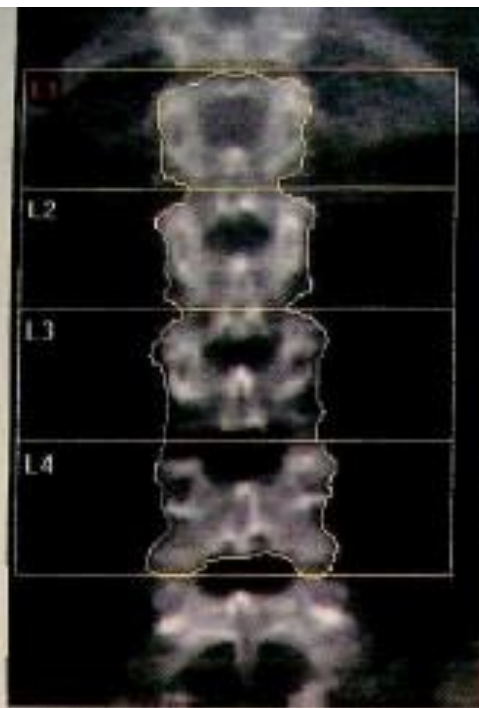
J Clin Densitom. 2019.
doi: 10.1016/j.jocd.2019.07.001

Official Positions - BMD reporting in postmenopausal women and in men age 50 and older

- ✓ T-scores are preferred.
- ✓ The WHO densitometric classification is applicable.

Official Positions - BMD reporting in females prior to menopause and in males younger than age 50

- ✓ Z-scores, not T-scores, are preferred. This is particularly important in children.
- ✓ A Z-score of - 2.0 or lower is defined as “**below the expected range for age**”, and a Z-score above -2.0 is “**within the expected range for age**”.
- ✓ Osteoporosis cannot be diagnosed in fertile females and men under age 50 on the basis of BMD alone.
- ✓ The diagnosis of osteoporosis in children and adolescents should not be made on the basis of BMD alone, but only in the presence of low-energy fractures (at least 1 vertebral crush or 2 or more long bone fractures).



k = 1.354, d9 = 48.2
116 x 133

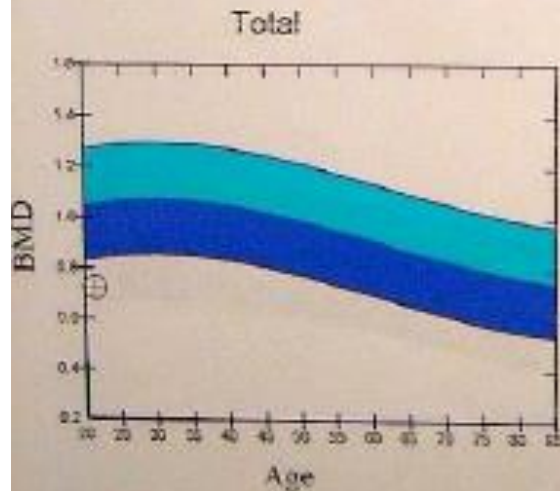
femmina di 21 anni

DXA Results Summary:

Region	Area (cm ²)	BMC (g)	BMD (g/cm ³)	T-Score	PR (%)	Z-Score	AM (%)
L2	11.87	8.59	0.724	-2.8	70	-2.6	72
L3	14.52	10.68	0.735	-3.2	68	-3.0	69
L4	15.19	10.82	0.712	-3.7	64	-3.5	65
Total	41.57	30.09	0.724	-3.2	67	-3.0	68

Technical: BMC = 1.0%, ACF = 0.92, BCF = 0.918, TH = 4.666

WHO Classification: Osteoporosis
Fracture Risk: High



Normative curves and age-specific values for White Females

**BMD al di sotto
della norma
per l'età**

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Bone disease in anorexia nervosa

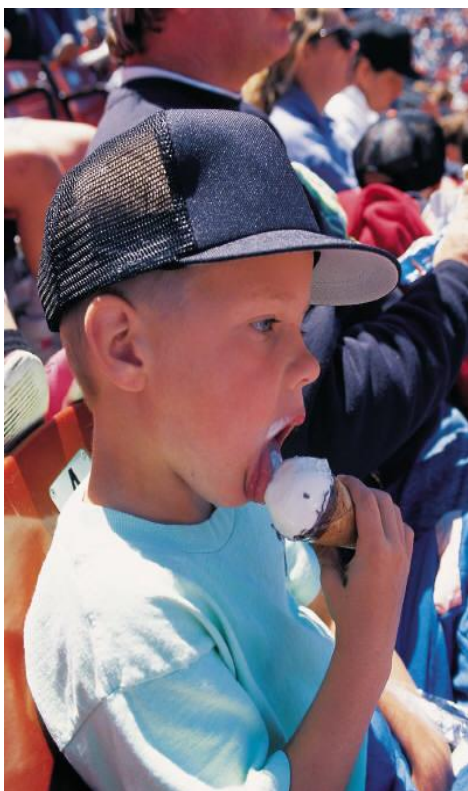
Anastasia D. Dede,¹ George P. Lyritis,² Symeon Tournis³



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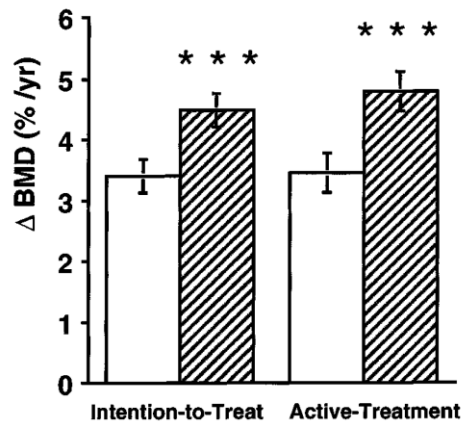
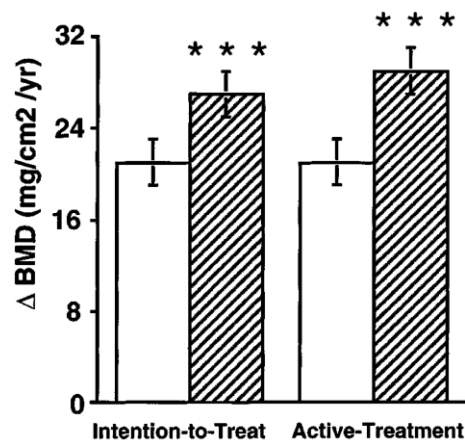
Table 2. Summary of the most important RCTs for the treatment of bone disease in patients with anorexia nervosa

Author / year	Intervention	Duration	N	Age	Outcome
Klibanski et al, 1995 ⁷¹	oral HRT / observation	18 months	48	16-42	↔ LS BMD
Strokosch et al, 2006 ¹⁹⁵	triphasic OCP / placebo	~12 months	112	11-17	NS change in BMD vs placebo
Misra et al, 2011 ¹⁹⁶	transdermal estradiol or ehtinylestradiol / placebo	18 months	110	12-18	↑ LS + hip BMD z-scores vs placebo
Bloch et al, 2012 ¹⁹⁷	DHEA / placebo	6 months	26	17-47	NS change in BMD vs placebo
Gordon et al, 2002 ¹⁹⁸	DHEA / OCP	12 months	61	14-28	↔ LS BMD, ↑ hip BMD NS vs placebo
DiVasta et al, 2012 ¹⁹⁹	DHEA + OCP / placebo	18 months	80	13-27	↑ BMD LS + hip + wholebody vs placebo
Golden et al, 2005 ²⁰²	alendronate / placebo	12 months	32	12-21	↑ BMD LS + hip NS vs placebo
Miller et al, 2011 ²⁰⁴	risedronate + testosterone / risedronate / testosterone/ placebo	12 months	77	18-45	Risedronate: ↑ LS + ↑ hip BMD vs placebo. Testosterone NS effect
Grinspoon et al, 2002 ²⁰⁶	rhIGF-I + OCP / rhIGF-I / OCP / placebo	9 months	60	18-38	rhIGF-I: ↑ LS BMD vs placebo. OCP NS effect rhIGF-I + OCP ↑> rhIGF-I ↑



RUOLO DEL CALCIO





CIBI RICCHI DI CALCIO E ACQUISIZIONE DI MASSA OSSEA

149 bambine sane pre-puberi

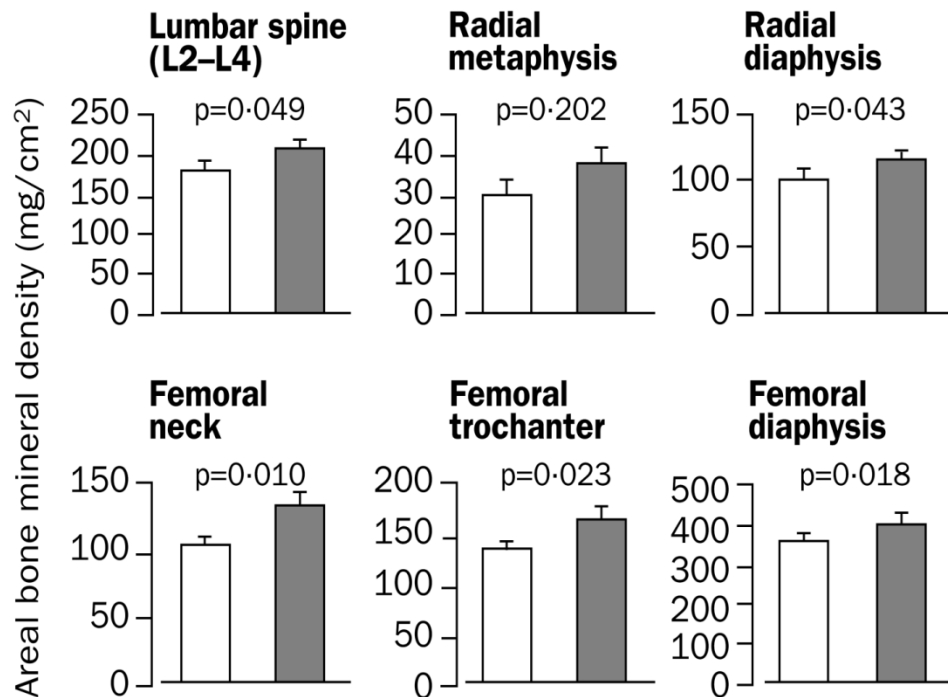
$7,9 \pm 0,1$ anni

randomizzate:

- 850 mg/die di calcio alimentare
- placebo

seguite per 1 anno

Spontaneous calcium intake	Active-treatment cohort			
	< median ^a		> median	
	Placebo	Ca suppl.	Placebo	Ca suppl.
	<i>n</i> = 29	<i>n</i> = 25	<i>n</i> = 24	<i>n</i> = 30
Calcium intake (mg/d)	711±19	1441±34	1224±76	1958±42
Δ Height (cm/yr)	4.8±0.2	5.4±0.3*	5.3±0.2	5.3±0.2
Δ Weight (kg/yr)	3.4±0.3	3.6±0.3	3.9±0.3	3.3±0.3
Δ BMD (mg/cm²/yr)	19±3	30±3 [§]	23±2	28±3
Δ BMC (mg/yr)	610±43	753±58 [§]	669±51	705±36
Δ Bone area (mm²/yr)	59.5±4.1	68.5±3.5	63.4±4.7	63.9±2.8



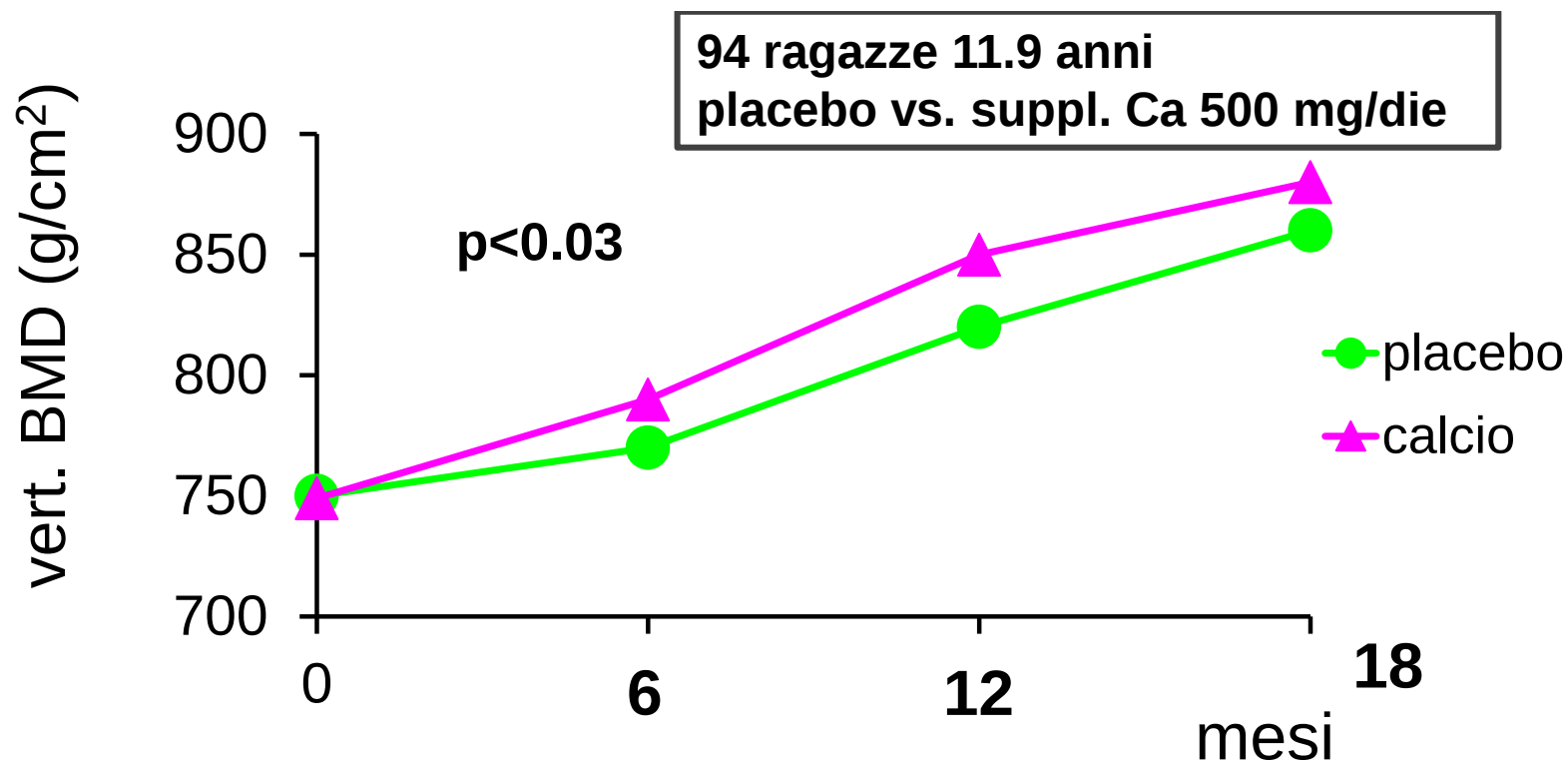
CIBI RICCHI DI CALCIO E ACQUISIZIONE DI MASSA OSSEA

116 bambine
dello studio precedente

Rivalutate 3-5 anni
dopo la sospensione
del calcio:

**BMD peristeva più elevata
nel gruppo delle trattate,
rispetto al placebo**

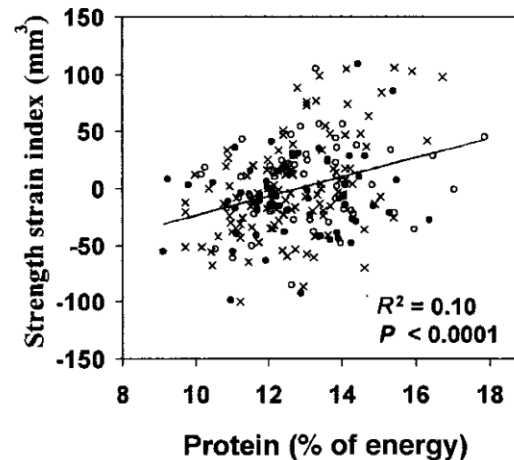
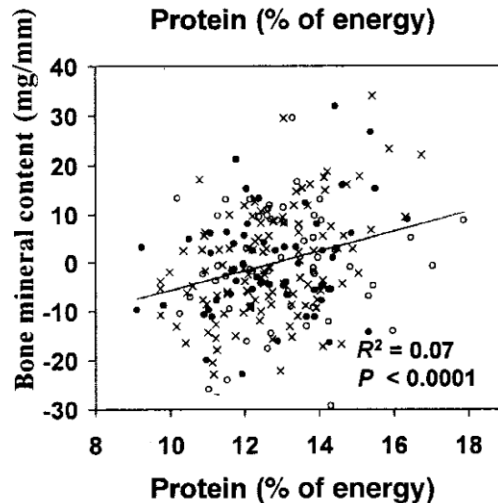
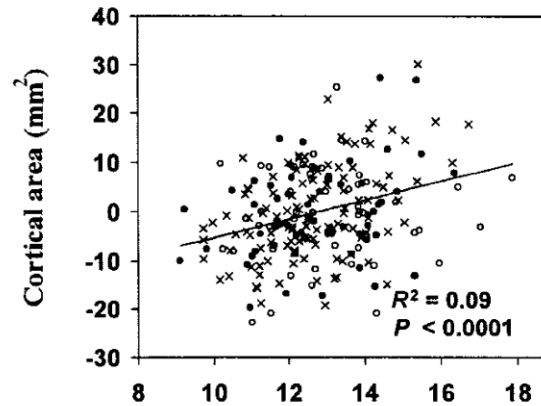
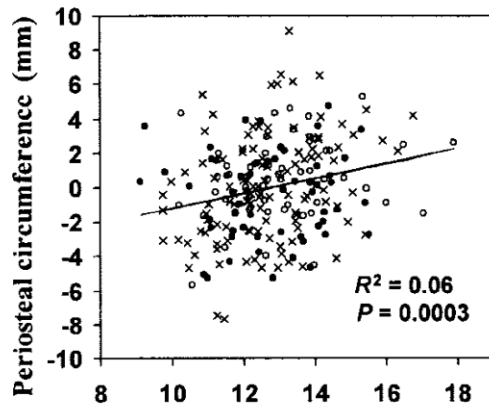
SUPPLEMENTI DI CA E BMD IN RAGAZZE ADOLESCENTI



RUOLO DELLE PROTEINE



PROTEINE E ACQUISIZIONE DELLA MASSA OSSEA



229 soggetti 6-18 anni
per 4 anni

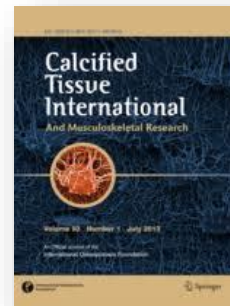
apporto PROTEINE

è associato con:

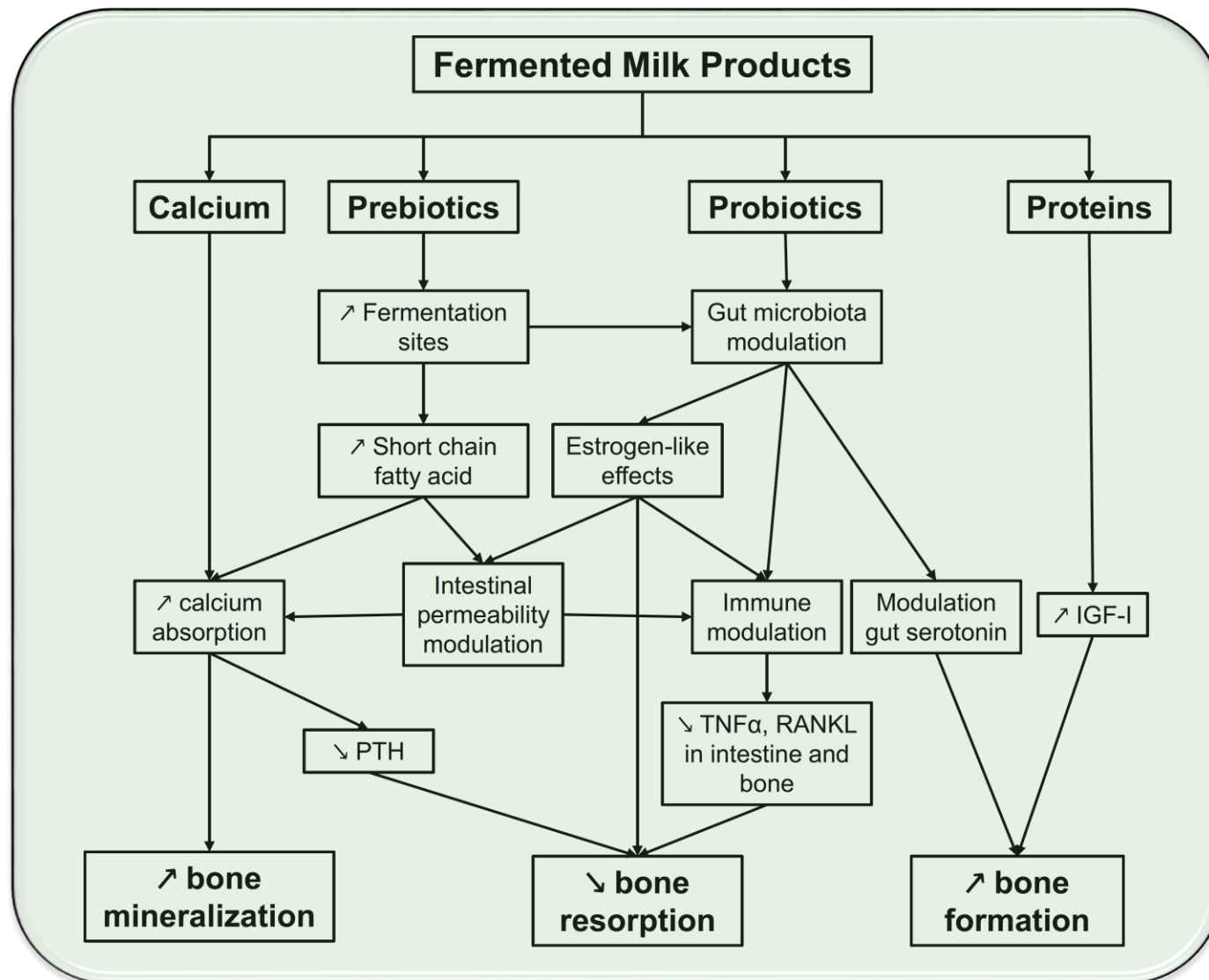
- circ. periostale
- area corticale
- BMC
- resistenza ossea

Effects of Fermented Milk Products on Bone

René Rizzoli¹ · Emmanuel Biver¹



Calcif Tissue Int.
(2018) 102:489–500



Dietary Guidelines for Children's Weight Gain

Be sure to include:



Unsaturated & polyunsaturated fats



Whole grains



Dairy products



Fruits & vegetables



Refined grains



Protein sources



pixta.com - 23398592



Grazie per l'attenzione