

# **Whole Body Vibration:** **A new exercise approach**

Presented by:

Martha R. Hinman, PT, EdD

Associate Professor

Department of Physical Therapy

The University of Texas Medical Branch

# Conditions treated in Europe with WBV

- strength and power training for athletes
- ligamentous knee injuries/repairs
- acute back problems
- osteoporosis
- neuromuscular disorders
- obesity (via hormonal effects)
- PVD/diabetes (to improve circulation)
- incontinence (via muscle strengthening)
- postural stability

# Contraindications/Precautions

- pregnancy
- recent or possible thrombosis
- cardiovascular complaints, e.g. valve disorder
- advanced arthrosis, arthropathy, acute RA
- recent sutures, scars and fresh wounds
- foot, knee and hip implants
- any metal/synthetic implants, e.g. pacemaker
- lumbar disc problems
- acute inflammations or infections

If you have any of these conditions - consult your doctor before using WBV

# Immediate and Short-Term Effects of WBV

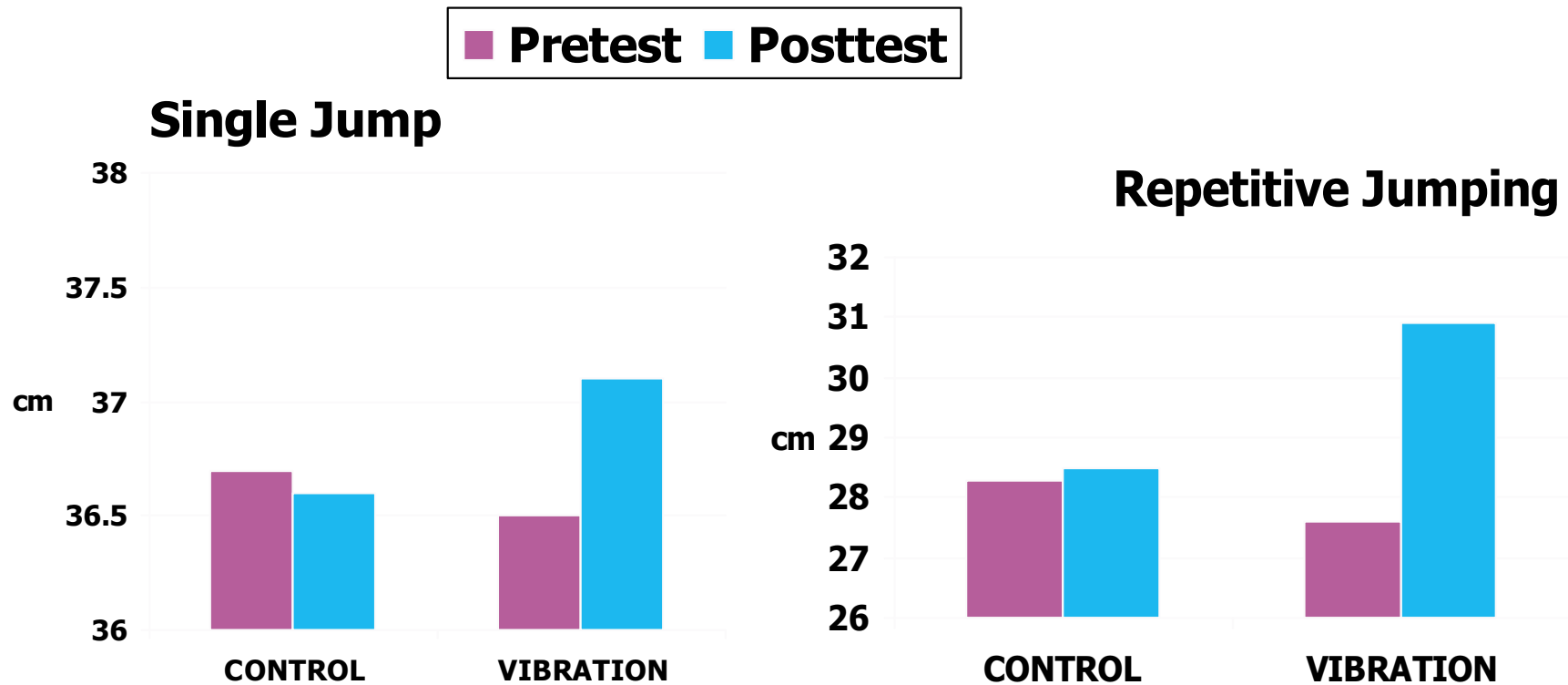
- Muscle strength and power
- Motor performance
  - *Vertical jump*
  - *Running speed*
  - *Balance*
- Other measures
  - *Hormone concentrations*
  - *Cardiovascular changes*

# Effects of WBV on Muscle Power

- Bosco examined effect of WBV on vertical jump in 14 active young adults who underwent 5, 90-120 sec. bouts of WBV x 10 days
- Used Galileo platform: amp. = 10 mm, frequency = 26 Hz

Bosco et al, 1998, *Biol Sport*, 15:157-164

# Effect of WBV on Vertical Jump



Bosco et al, 1998, *Biol Sport*, 15:157-164

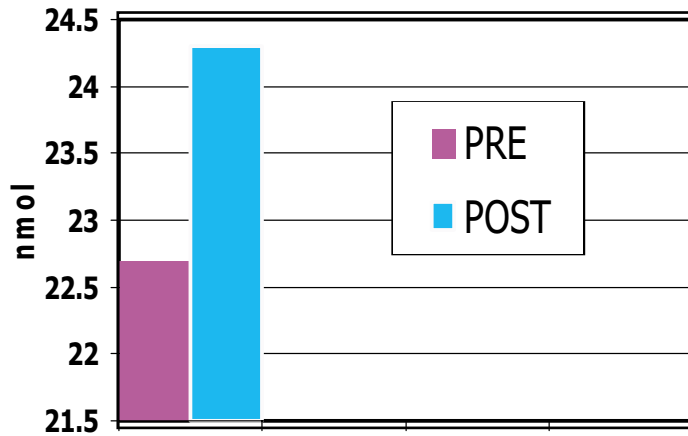
# Hormonal Responses to WBV

- Bosco observed changes in neuromuscular performance and plasma hormone levels in 14 young, athletic men following WBV
- 60 sec. WBV followed by 60 sec. rest, repeated 10 times
- Used NEMES platform: amp. = 4 mm @ 26 Hz; est. acceleration force = 17 g

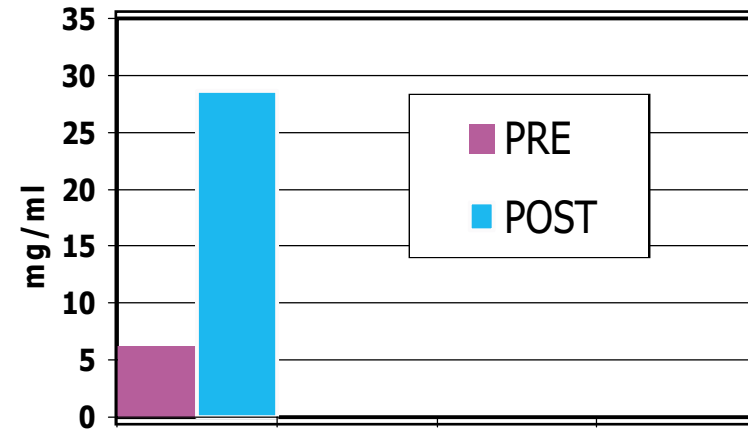
Bosco et al, *Eur J Appl Physiol*, 2000, 81:449-454

# Hormonal Changes after WBV

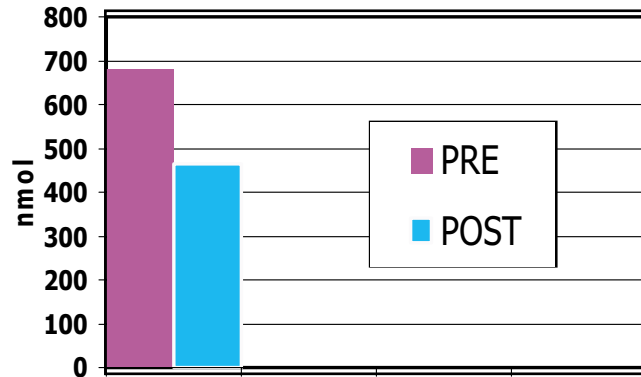
## TESTOSTERONE



## GROWTH HORMONE



## CORTISOL



Bosco et al, *Eur J Appl Physiol*, 2000, 81:449-454

## Other Findings and Conclusions

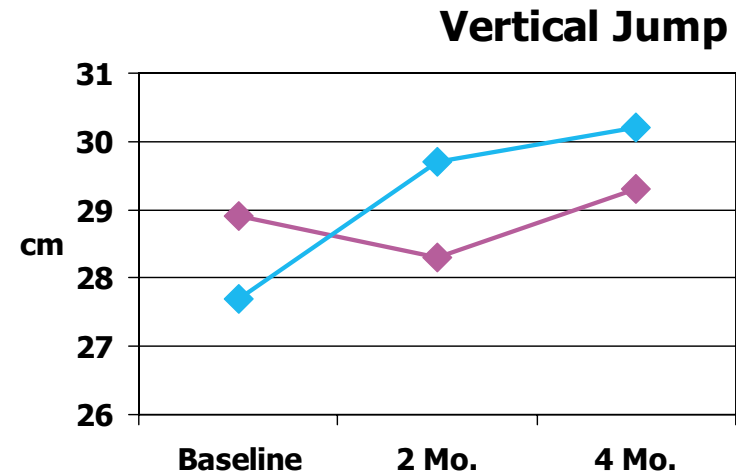
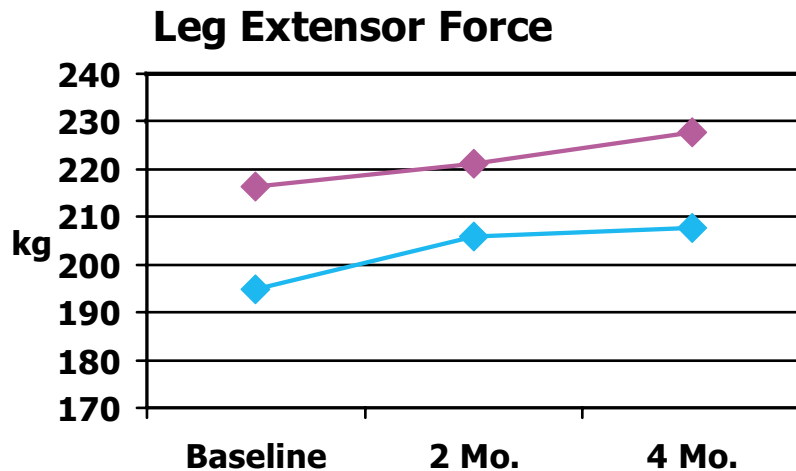
- Mechanical work output of leg extensor muscles was significantly enhanced while EMG activity was reduced
- Jumping performance also improved
- Increased plasma concentrations of T and GH suggest “neural potentiation effect” similar to power weight training but without the general stress response (i.e., decreased cortisol levels)

# Long-Term Effects of WBV

- Muscle strength/performance
- Motor control
- Balance
- Chronic pain Relief
- Bone density/strength
- Weight-loss

# Changes in Muscle Strength

—◆— CONTROL —◆— VIBRATION



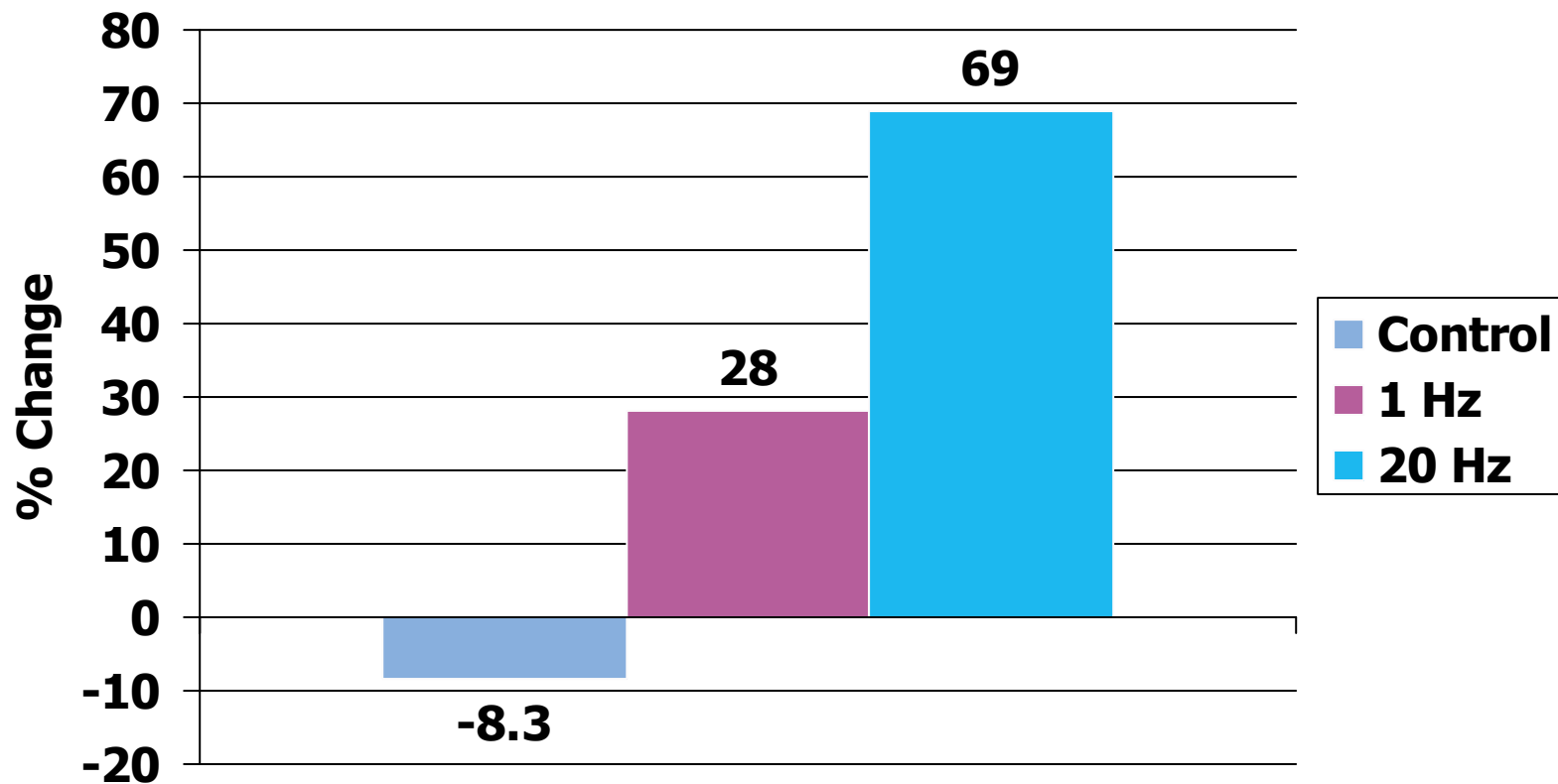
Torvinen et al, *Med Sci Sports Exerc*, 2002,34:1523:1528

Percent differences in bone parameters for vibrated vs. control sheep (after 1 yr.)

Total bone density	+ 6.5%	Trabecular density	+ 34.2%
Total bone volume	+ 32%	Trabecular number	+ 45%
Bone formation rate	+ 113%	Mineralizing surface	+ 144%

Rubin, et al, *Nature*, 2001, 412:603-604

# Percent of Bony Ingrowth @ 8 wks. (titanium implant in turkey ulna)



Rubin & McLeod, *Clin Orthop Rel Res*, 1994, 298:165-174

## Rubin's overall findings suggest:

- Doubling of bone formation rates
- 25% increase in strength of trabecular (vs. cortical) bone
- Inhibition of disuse and post-menopausal bone loss
- Postulated relationship between age-related sarcopenia and osteoporosis

Rubin et al, *Drug Discov Today*, 2001, 6(16):848-858  
(overview of work; has numerous other publications)

## Human Pilot Studies: Prevention of bone loss in postmenopausal women

- RCT of 67 postmenopausal women in US who underwent 20 min./day WBV for 1 year (vs. placebo)
- Placebo group lost 3.8% in spine and 5.5% in femur
- WBV group **only lost 1.0% in spine and 1.5% in femur**

Rubin et al, *Bone*, 1998, 23:S174 (abstract)

## Senior Studies?

- Runge conducted a crossover study involving 34 older adults in Germany who underwent 6 min. of WBV 3 times/week x 6 months
- Preliminary data (n=19) – chair rise time decreased by 18% in WBV group; no adverse effects reported

Runge et al, *J Musculoskel Neuron Interact*, 2000, 1:61-65