

STAND UP FOR INDEPENDENCE

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DISCLOSURE

Maryann M. Girardi, PT, DPT, ATP is an employee of Altimate Medical, Inc

SOMEONE'S INDEPENDENCE IS THE FACT THAT
THEY DO NOT RELY ON OTHER PEOPLE.

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NEEDED FOR INDEPENDENCE

- Strong bones
- Ability to move body parts against gravity
 - Functional Range of Motion
 - Minimalization of abnormal muscle tone
- Endurance

HOW CAN STANDING HELP?

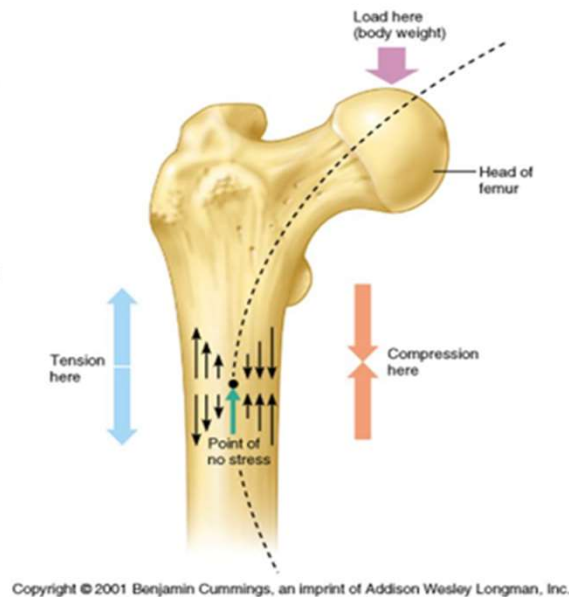
- Increase/Maintain Skeletal Strength and Architecture
- Improve Motor Function
- Improve Cardiopulmonary Function
- Improve Bowel and Bladder Function
- Improve Quality of Life

BODY ADAPTS TO THE STRESSES PUT ON IT

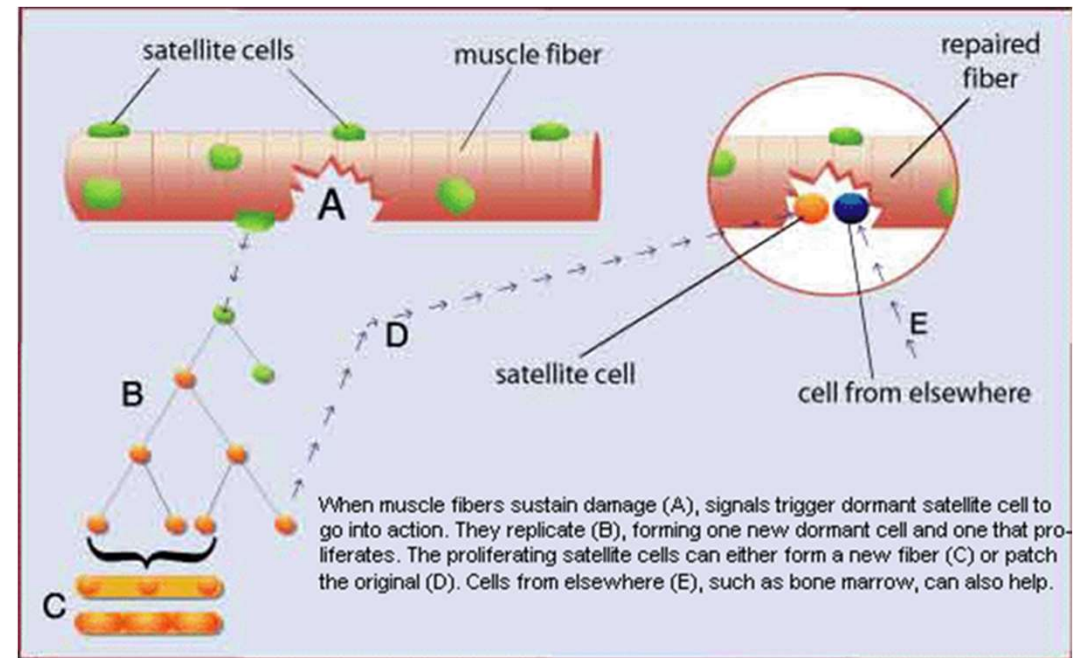
Bone

Wolff's Law

Tension and compression cycles create a small electrical potential that stimulates bone deposition and increased density at points of stress.



Muscle



<http://doctorsgates.blogspot.com/2011/02/satellite-cells-in-skeletal-muscle.html>

Smith LR, Chambers HG, Lieber RL. Reduced satellite cell population may lead to contractures in children with cerebral palsy.

BONE MINERAL DENSITY

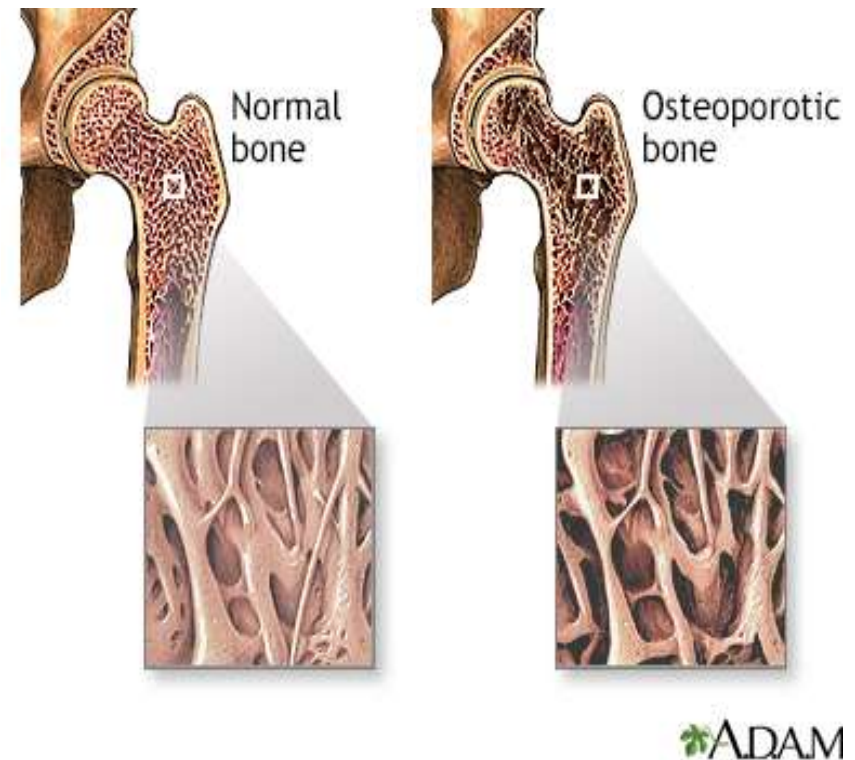
- Decreased bone mineral density increases the risk of fractures
- Peak BMD levels occur between 25–30 years of age
- Starting around 40 years of age we, ALL start losing
- Skeletal loading leads to increased bone formation
- You can never regain bmd you had in your youth

<https://orthoinfo.aaos.org/en/staying-healthy/healthy-bones-at-every-age>

Rolvien T, Amling M. Disuse Osteoporosis: Clinical and Mechanistic Insights. *Calcif Tissue Int*. 2022;110(5):592–604. doi:10.1007/s00223-021-00836-1

DISUSE OSTEOPOROSIS

- State of bone loss due to skeletal unloading
- CP-90% have abnormal values
- 87% of DMD have osteoporosis
- SCI- 82% abnormal values after 2 years
- CVA- 42% osteoporosis
- MS-27% abnormal values
- $BMD < 1.0 \text{ g/cm}^2$ = Increased risk of Fractures



Nurković, J et al. Measurement of Bone Mineral Density in Children with Cerebral Palsy from an Ethical Issue to a Diagnostic Necessity. *BioMed research international* vol. 2020 7282946. 19 Sep. 2020.

Henderson R.C., Lark M, Gurka M.J, Worley G, Fung EB, Conaway M, Stallings VA, Stevenson RD. Bone Density and Metabolism in Children and Adolescents With Moderate to Severe Cerebral Palsy. *Pediatrics* July 2002; 110 (1): e5.

Barzegar M, Niknam E, Habibi P, Shiva S, Tahmasebi S. Bone Mineral Density and Bone Metabolism in Patients with Duchenne Muscular Dystrophy. *Iran J Child Neurol*. 2018;12(1):77-83.



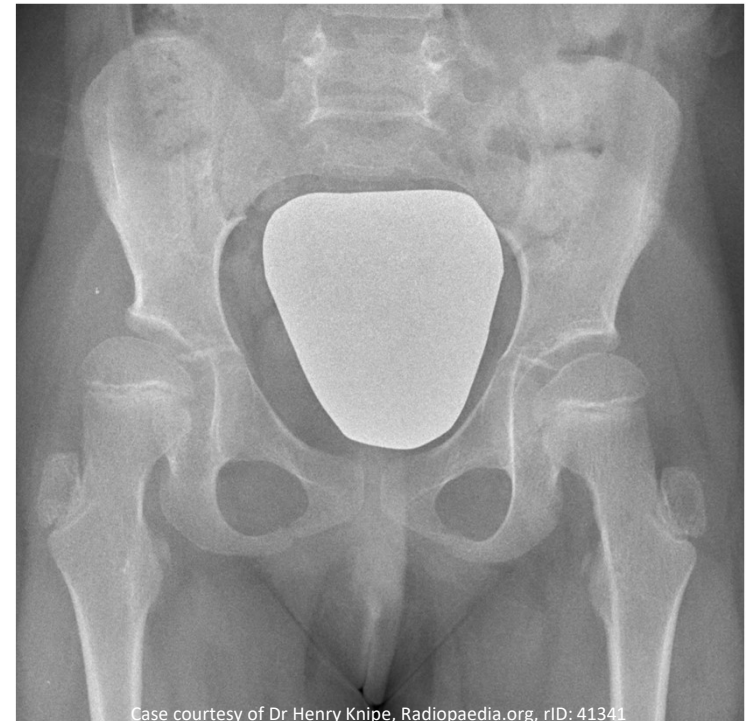
BMD

STANDING 60-90 MIN/DAY

- Individuals who stand demonstrate an increase trend in bone mineral density
- Standing
 - Stimulates mechanical receptors
 - Reduces Sclerostin levels
 - Reduces resorption
 - Decreases calcuria

HIP DYSPLASIA

- Prevalence MP >30% is 25% to 60%
- Directly related to GMFCS level
- GMFCS I and II with Winters, Gage, Hicks gait have increased risk
- Peak age of occurrence is 3 to 5 years
- MP increase of 10% per year increases risk of dislocation



HIP DYSPLASIA

STANDING 60-120 MIN/DAY

- Standing in 30°-60° of total abduction
 - Facilitate development of hip joint
 - Increase/maintain ROM
 - Decrease/maintain lateralization of the femur



RANGE OF MOTION

- Shortening of muscle fibers begins within 24 hours of immobility
- Children with CP consistently lose LE ROM between the ages of 2-14
- Wheelchair users demonstrate limits in LE ROM
- Prolonged stretching is most effective in maintaining/increasing ROM



ROM STANDING 45-60 MIN/DAY

- Evidence shows that those who participate in standing programs demonstrate an increase in LE ROM for individuals with neurological conditions such as CP, SCI, Stroke, TBI and MS
- ROM returns when standing is stopped

SPASTICITY

- 38% of stroke survivors experience spasticity within one year after a first stroke
- 84% of MS, 34%, it affects their daily
- 62% of SCI
- 82.9% of CP



SPASTICITY STANDING 30 TO 45 MIN/DAY

- Shown to reduce spasticity for those with MS, SCI, CP, stroke
- Decrease in tone lasts for min of 30min with some reports over night



MOTOR FUNCTION STANDING 30 MIN/DAY

- Increased scores on motor tests for individuals
- Improvements seen in sitting and standing balance
- Improvement in LE and trunk strength seen
- Functional position for UE and aerobic activities
- Improved quality of gait for individuals with CP and stroke
- Maintain standing transfers ability

CARDIOPULMONARY STANDING 30 MIN/DAY

- Improved Tidal volume and forced expiratory volume
- Combats Orthostatic hypotension
- Improved circulation/Reduced swelling





QUALITY OF LIFE

- 87% improved sense of well-being
- 25% reported improved sleep
- 31% decreased pain
- 52% reported improved bowel function
- 21% reported improved emptying
- Increased participation in activities
- Sense of freedom

Dennett R, Hendrie W, Jarrett L, et al. "I'm in a very good frame of mind": a qualitative exploration of the experience of standing frame use in people with progressive multiple sclerosis.

BMJ Open. 2020;10(10):e037680. Published 2020 Oct 28. doi:10.1136/bmjopen-2020-037680

Eng JJ, Levins SM, Townson AF, Mah-Jones D, Bremner J, Huston G. Use of prolonged standing for individuals with spinal cord injuries. *Phys Ther*. 2001;81(8):1392-1399. doi:10.1093/ptj/81.8.1392

SUMMARY

- Provides the support to enable upright posture in a safe and stable environment
 - Provides stimulation to the skeletal system for strength and growth
 - Maintains/increases range of motion
 - Enables learning or relearning of motor skills to improve strength, posture, balance and function
 - Improved sense of well-being and quality of life

QUESTIONS?

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