

Strong Bones Lecture – Research, supplemental reading

Research search made through Pubmed, <http://www.ncbi.nlm.nih.gov/pubmed>

Research search criteria:

Subject - Osteoporosis treatment through physical activity

Dates - Sept 2010 through Sept 2013

Age of subjects - 19+ years

Type of subject - Human

Language of paper - English

Summary of research findings, specific to search criteria above, over past 3 years:

- Bone Mineral Density increases due to increased physical activity may be sex specific
  - Increased BMD (by 2.7-7.7%) in college age males after 24 weeks of strength training. No or very little (-0.8 -1.5%) increase for females (Almstead et al., 2011)
  - After 40 weeks of strength training, using both high intensity and low intensity protocols, both men and women responded similarly in BMD in the hip sites but men showed a greater response at the lumbar spine than women (Bemben et al., 2011)
- Bone mineral density increases due to increased physical activity may be site specific
  - After 40 weeks of resistance training, BMD increased at the femur and lumbar spine locations. Total body BMD did not increase (Bemben et al., 2011)
  - After 12 months of cardio and strength training (4-6 week blocks of bone-building exercises interspersed in between 12 week cardio blocks), early post-menopausal women saw less BMD loss than controls in the lumbar spine, -0.3% versus -2.1%; and in the trabecular region, -0.7% versus -4.7%; but no change in BMD of the hip (Kemmler et al., 2013)
- Non – Impact physical activities do not increase bone density
  - Cyclists have decreased bone mineral density (Nichols et al., 2011)
  - Aquatics exercise – No change in lumbar or femur bone mineral density in older women (Pernambuco et al., 2013)
- Strength Training may be helpful in preventing bone loss in female cancer survivors
  - Moderate intensity resistance and impact training (jump) in post-menopausal breast cancer survivors (>1 year post radiation and/or chemo) preserved BMD at the lumbar spine (Winters-Stone et al., 2011).
  - After 12 months of aerobic jumping and circuit training exercises, breast cancer patients who were pre-menopausal prevented bone loss at the femoral neck but lumbar bone loss still occurred. In post-menopausal women, no significant exercise effect on BMD was found at the femoral neck or lumbar spine (Saarto et al., 2012)

- Total hip bone mineral density improved more in younger breast cancer survivors who went through a resistance plus impact training program than in older breast cancer survivors undergoing the same program (Winters-Stone, et al., 2012)
- Vibration plate therapy may be helpful in reducing bone loss and or falls
  - Performing dynamic leg strength training on vibration plates may decrease falls in post-menopausal women (von Stengel et al., 2011)
  - Eight months of twice weekly whole body vibration may reduce bone loss at the hip and spine and improve lower limb muscle function in elderly post=menopausal women (Beck et al., 2010)
  - A systematic review and meta-analysis of thirteen randomized trials (18 articles), with 4 being of good or excellent methodological quality and the rest rated fair, it was found that whole body vibration is beneficial for enhancing leg muscle strength among older adults but the review suggests that it has no overall treatment effect on BMD in older women (Lau et al., 2011)
- Post-menopause, increased hip BMD through strength and jumping exercises (Bolton et al., 2010)
- Early post-menopause (1-8 yrs), after 12 years of supervised exercise, BMD in the lumbar spine decreased by only -0.8% versus -4.0% in the control group. BMD at the femoral neck decreased by almost half, -3.7% versus -6.7% for the control group. Both groups were taking Calcium and Vitamin D supplementation (Kemmler et al., 2012)
- Pre-menopause, no change in BMD after 28-week resistance training program (Vanni et al., 2010).
- Bone mineral density may not increase but women who are physically active have geometrically stronger femurs (Beck at al., 2011)
- Mainly home based exercises followed by voluntary home training seem to have a long term effect on balance and gait and may even protect high-risk elderly women from hip fractures (Korpelainen et al., 2010)
- Circuit exercises will improve mobility and health related quality of life of elderly women with osteoporosis and a history of vertebral fractures (Bergland et al., 2011)
- Jumping exercises (up to 5x10 vertical and versatile jumps) performed in an office setting for 12 months increased femoral neck BMD in pre-menopausal Japanese women (Niu et al., 2010)
- An 18 month resistance training with weight bearing impact activities exercise program performed by middle-aged and older men, increased bone density at the lumbar spine and femoral neck. In subjects who consumed Calcium and Vitamin D3 in addition to performing the exercise program, the osteogenic response was not enhanced (Kukuljan et al., 2011)
- A meta-analysis of randomized controlled trials, of post-menopausal women who exercised found, statistically significant, but small, improvements in BMD for both the femoral neck and lumbar spine (Kelley et al., 2012)
- A systematic review of literature (59 controlled studies, 7 meta-analyses, 8 reviews) looked at the effects of training on bone mass in older adults. The studies included in the review indicated that bone related variables can be increased, or at least the common decline in bone mass

during aging attenuated, through following specific training programs. Walking provides only modest increases in skeletal load, therefore it is less effective in osteoporosis prevention. Strength training, however, seems to be a powerful stimulus to improve and maintain bone mass during the ageing process. Multi-component exercise programs including strength, aerobic, high impact and/or weight bearing training, as well as whole-body vibration alone or in combination with exercise, may help increase or at least prevent decline in bone mass with aging, especially in post-menopausal women (Gomez-Cabello et al., 2012)