

## Views From the E-List\* – Bone Density

### Query:

I am wondering if anyone has references I can site on the benefits of waters resistance helping bone density. I am a personal trainer(ACE) and just read an In depth article from the Oct/Nov 08 issue of ACE Certified News titled Go Ahead and Jump. I was disappointed to see the author state that swimming was not an appropriate form of exercise for preventing or halting the effects of osteoporosis. I would like to write to ACE and have this updated. Does anyone have any references I could site to send to ACE? I have Ruth Sova's book Aquatics and in it a reference to an Israeli study by Lindle 1994. Any others? Thanks!!

### Responses:

Go to [www.atri.org](http://www.atri.org) and click on Articles of Interest. There's a full series of research and research-based articles.

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Unfortunately, there are no well-done studies demonstrating aquatic activity building bone mineral content in areas that are clinically critical: the spine, or hips. A study in 1996 by Bravo used a program very specifically intended to create impact loading, and found that after a year, there was still some bone mineral loss, although far less than in their control population. So such programs can slow the progression but not stop it. The Israeli study was not definitive at all, IMHO. Several Japanese studies found that radial and calcaneal bone density could be maintained, but these are pretty minimal risk bone areas. Some rat studies showed that rat swimmers sustained bone mineral content, but these are tough to extrapolate into human populations.

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As much as I'd like to believe otherwise, I would have to agree on the face of the published evidence that the ACE article is correct.

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A recent article in the BLOG of Aquatic NETwork has a summary of Rotstein A, Harush M, Vaisman N. The effect of a water exercise program on bone density of postmenopausal women. J Sports Med Phys Fitness. 2008 Sept;48(3):352-9. If you can get the article, I am sure that you will find lots of references.

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This is one of my favorite topics--so here goes:

I have done a lot of research (on my own) re water activities and osteoporosis. From my reading, the research on SWIMMING indicates that it does not build bone mass except perhaps a bit in the lower arm area as that is where the "pressure" is applied for most fitness swimmers (they usually swim front crawl, back crawl and breast stroke for fitness swimming). The leg motion (kick) for these strokes is mainly done for balance as opposed to speed--so there is not much "pressure" on the legs. To build bone mass, there must be some pressure (muscular demand) imposed on the bone to build BMD. However, there is a gathering of evidence (just a handful of studies) that WATER EXERCISE *may* cause a slight increase in BMD (although not statically significant) in the low back and legs. Remember that swimming and water exercise are physiologically different in application of strength to the water.

Some of the water exercise studies are done in shallow water and some studies are done with deep water exercise. However most of these studies are done for relatively short periods of time (less than a year). BMD takes a long time to increase, studies of 1-2 years or more are needed to see if water exercise can build BMD. Check both the ATRI articles of interest and the Aquatic Network for citations.

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For individuals seeking research on bone density and aquatic activity --

<http://www.thieme-connect.com/ejournals/pda/abstract/sportsmed/doi/10.1055/s-2006-924517>

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### *A Cumulative Effect of Physical Training on Bone Strength in Males*

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Abstract

Weight-bearing, high-impact exercise, as opposed to nonimpact exercise, has been demonstrated to increase bone mineral density. This was traditionally demonstrated with dual energy X ray absorptiometry. Our objective was to assess the differences in bone properties, using quantitative ultrasound (QUS, Sunlight Omnisense™, Sunlight Medical, Ltd., Tel Aviv, Israel), in male athletes involved in a weight-bearing, impact sport (soccer, SC) or a nonimpact sport (swimming and water polo, AQ), compared with nonathletic control (C) males. A total of 266 boys and men, aged 8 - 23 years, were divided into children ( $11.1 \pm 1.0$  years; 34 SC, 34 AQ, 25 C), adolescents ( $14.7 \pm 1.2$  years; 32 SC, 31 AQ, 31 C), and young adults ( $19.8 \pm 1.1$  years; 31 SC, 24 AQ, 24 C). Training experience varied between 1.5 years in the children to 15 years in the adults. Bone speed of sound (SOS) was measured bilaterally at the distal radius and the mid-tibia. Body fat was significantly lower in athletes compared with C. AQ were generally heavier and had a higher fat-free mass compared with SC and C, with no significant differences in height between groups. Radial SOS increased with age, but no differences were observed between activity groups or between the dominant (D) and nondominant (ND) arm. Tibial SOS also increased with age. In the children and adolescents, no differences were observed between activity groups. However, among adults, both SC and AQ had higher tibial SOS compared with C. These differences were mainly explained by differences in fat-free mass. Among young adults but not among children and adolescent males, both soccer and aquatic sports appear to be associated with higher bone SOS in the lower, but not the upper, extremities. Further studies are needed to assess possible sport-specific mechanisms which affect bone properties and to determine the minimal cumulative effect which is needed to influence bone properties.

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This is an interesting study, with some significant issues. In addition to it being a male study, with population groups not susceptible to osteoporosis, it didn't look at alternative training activities. Both competitive swimmers and water polo players often augment aquatic training with weight resistance training, and the paper doesn't assess this possibility. It is a stretch to apply it to a female aquatic exercise group. That said, it is interesting work, and like all science, adds as many questions as it answers.

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*\*Opinions and suggestions expressed in this column represent e-list member responses to the query posted. They are not represented by the Aquatic Therapy and Rehab Institute and/or the author(s) of this column as recommendations regarding appropriate practice.*