The Effects of Swimming on Bone Mineral Density

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Key Points:

- **Bone mineral density (BMD) is a marker of bone health.**
- **Low BMD results in osteopenia and osteoporosis.**
- **Swimmers have similar BMD to sedentary individuals.**
- **While swimmers have reduced BMD compared to other athletes, they may have increased bone turnover resulting in a stronger bone structure.**

Bone mineral density is an important marker of bone health. Low bone mineral density results in diseases such as osteoporosis and osteopenia that increase an individual's risk of fracturing bones [1,2]. It is known that applying force to bones through impact or mechanical strain via muscle activation is an important part of promoting increased bone growth and bone mineral density, which in turn reduces risk for these diseases[1,2]. Swimming is a sport that applies less force to bones compared to other high impact sports, due to its athletes spending a significant amount of time in the hypo-gravity environment of a pool. Therefore, concerns have been raised about the possible negative impacts of swimming on bone health[1].

Research has demonstrated that swimmers tend to have the same BMD as sedentary individuals and lower BMD compared to athletes who participate in impact sports[1,2,3], though it may vary by skeletal site[1,3]. This demonstrates that swimming does not provide sufficient bone loading to produce increased BMD[2,3], which is concerning when evaluating the risk of an individual developing osteopenia or osteoporosis.

The study "A Comparison of Bone Mineral Densities Among Female Athletes in Impact Loading and Active Loading Sports" looks at bone mineral density of female athletes at several skeletal sites across impact sports (gymnastics and volleyball) and swimming expressed as percent difference from inactive control subjects (Figure 1). At all sites represented, the swimmers' BMD was lower than the impact sport athletes' BMD, and at all sites there was no significant difference between swimmers' BMD and the control subjects' BMD[3]. This suggests that swimming does not have a positive impact on BMD.

Despite the comparable BMD observed in swimmers and sedentary subjects, swimming seems to stimulate a higher rate of bone turnover which is an indication of bone remodeling. It is thought that this increased turnover without increases in BMD may be associated with a more efficient and stronger bone structure compared to sedentary individuals, though still weaker than impact athletes[2]. Furthermore, swimming does not negatively impact bone mass[1,2]. This suggests that the bone health of swimmers may not be as at risk as initially hypothesized.

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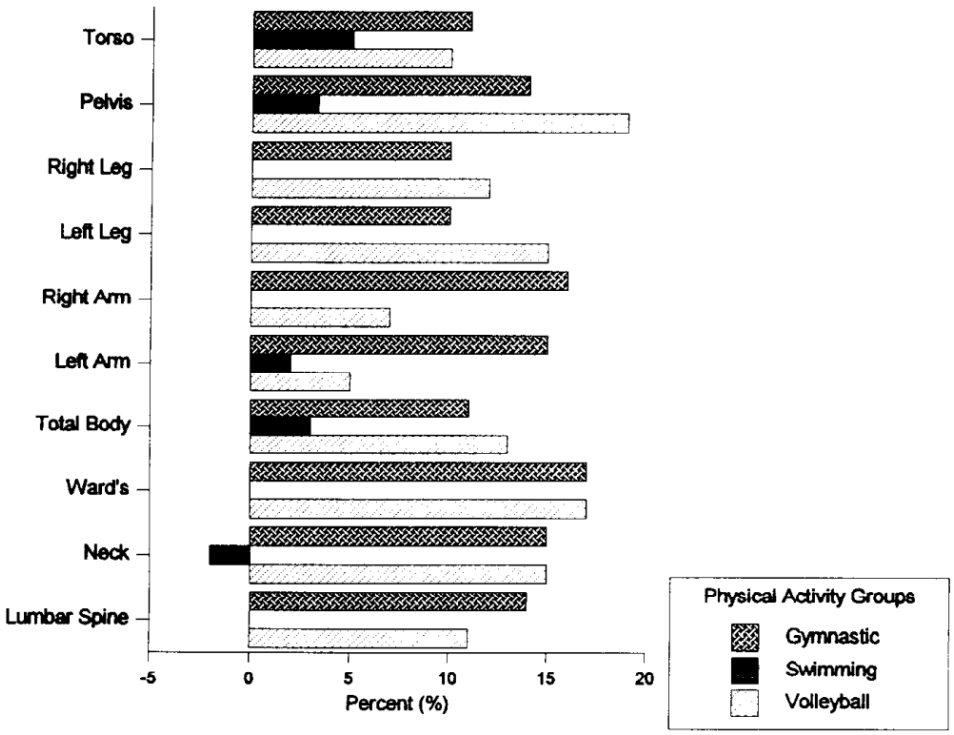

Figure 1: The percent difference of swimmers' BMD (black bars) compared to inactive control subjects was not significant, suggesting that swimming does not positively impact BMD. Volleyball and gymnastics (impact sports) did show significant percent increases in BMD compared to the inactive control group, reinforcing the idea that impact sports positively affect BMD[3].

The observed decrease in BMD of swimmers compared to impact athletes emphasizes the importance of bone loading activities on bone health. While swimming does not harm bone health despite the significant amount of time spent in a hypo-gravity environment[1] and does provide some adaptations that increase bone turnover and therefore bone strength[1,2], the mechanical load produced by muscle is not large enough to produce increased BMD[2,3]. Therefore, it may be recommended that swimmers participate in some type of resistance training in addition to their swimming to reduce their risk of developing osteopenia and osteoporosis.

References

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