

# Effects of Weight Bearing and Non-Weight Bearing Sports on Bone Quality in Male Collegiate Athletes

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## Introduction

Bone quality has been correlated with lifetime physical activity. The bone quality of male collegiate athletes was measured to investigate the effect of weight bearing load in sports on bone health. For the purpose of this study, soccer, football, and cross-country were considered weight bearing sports (WB), while cycling and swimming were non-weight bearing (NWB) sports.

## Methods

Bone scans were completed with an Achilles InSight Ultrasonometer device (Figure 1). Male collegiate athletes (n=50); ten subjects from each sport received a calcaneal bone scan on both feet. All tests were performed in the fall sports season when subjects were in-season training for competition. Strength training regimens differed for each sport. The subjects had no history of musculoskeletal injuries within 12 months prior to the bone scans.

This device provided three values used for analysis of bone health: Broadband Ultrasound Attenuation (BUA: dB/MHz), Speed of Sound (SOS: m/sec), and Stiffness Index (SI). Stiffness index is calculated from combining the BUA and SOS values. The BUA, SOS, and SI were compared between sport, weight bearing vs. non-weight bearing activities, and foot dominance using a two-way ANOVA with repeated measures, with significance at  $p < 0.05$ .

## Results

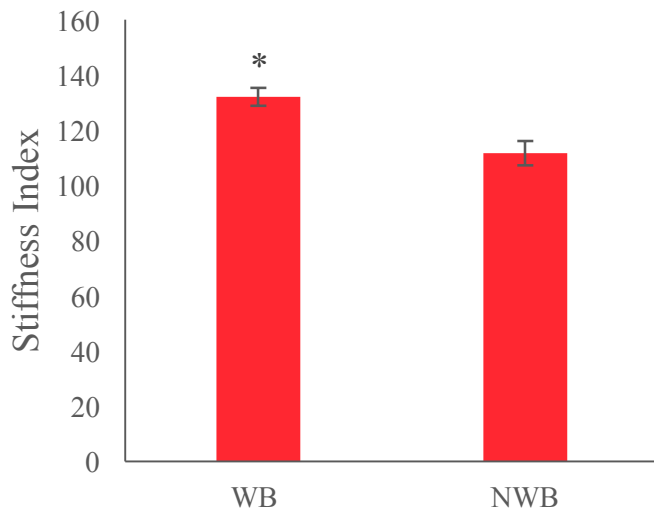
Bone quality among weight bearing sports was significantly ( $p < 0.01$ ) greater than non-weight bearing sports based on the stiffness index (Figure 2a).

There were significant differences ( $p < 0.01$ ) in SI values for dominate foot between cycling and all WB sports (soccer, football, cross-country), but swimming was only significantly different ( $p < 0.01$ ) from soccer (Figure 2b). These results could be attributed to increased impact load, multi-directional movement patterns and increased strength training in WB sports. Energy balance, nutrition, hormone mediated bone turnover and genetic factors may also contribute to these results.

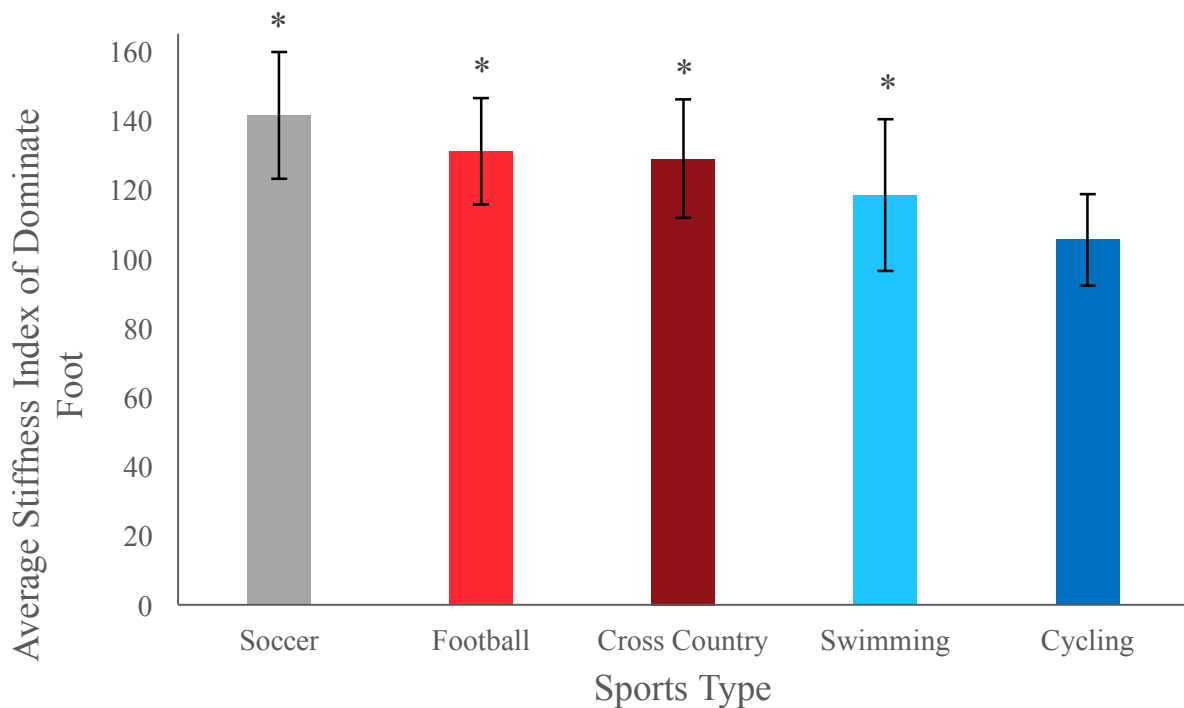
## Conclusions

Collegiate male athletes in weight bearing sports have greater bone quality than athletes in non-weight bearing sports. Health professionals and coaches should educate athletes on developing behavioral strategies to optimize bone health through proper diet and weight bearing exercise as a preventative measure.





**Figure 2a.** Comparison of SI values between WB (soccer, football, cross-country) and NWB (swimming and cycling) sports. Significant difference ( $p < 0.01$ ) between WB and NWB groups. Error bars indicate standard error.



**Figure 2b.** Comparison of SI values between dominate foot for each sport. There was significant difference ( $p < 0.01$ ) between all sports and cycling. Error bars indicate standard error.

**Key words:** cycling, biomechanics, power output, pedalling effectiveness, performance

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