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# Bone and body characteristics of freestyle and non-freestyle skiers

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## Abstract

**Background:** Freestyle skiers must optimize their aerial performance by maintaining the strength and coordination to propel themselves in the air and adapt to landings and take-offs on uneven surfaces. The purpose of this study was to investigate the differences in areal bone mineral density (aBMD) and body composition in freestyle skiers and non-freestyle skiing controls. We hypothesized that the unique demands and summation of forces experienced by freestyle athletes would manifest as greater femoral neck aBMD, lower percent body fat, and lower Body Mass Index (BMI) than non-freestyle skiing controls. This is a retrospective cohort study.

**Methods:** Eighteen freestyle skiers (14 M 4 F, [27.56±5.22 years]) and 15 controls (7 M 8 F, [26.93±3.54 years]) were measured with dual energy X-ray absorptiometry (DXA) to determine total body composition, hip and lumbar spine aBMD, and bone mineral composition (BMC). Height and weight were measured with an in-office stadiometer and scale. Questionnaires were used to determine physical activity and pertinent medical history. Between-group variations were analyzed with an analysis of variance (ANOVA) and stratified by sex.

**Results:** Percent body fat, hip and lumbar spine aBMD, BMC, and area were all similar between freeski and non-freeski athletes ( $P < 0.05$  for all). BMI was significantly lower in male freeski athletes ( $23.97 \text{ kg/m}^2$ , 95% CI: 22.75-25.18) compared to non-freestyle skiing controls ( $26.64 \text{ kg/m}^2$ , 95% CI: 24.43-28.86) ( $P = 0.03$ ).

**Conclusions:** Freestyle skiers have a lower BMI than non-freestyle skiers. All skiers in this study have similar percent body fat, aBMD, and BMC. This pilot study supports that there are unique musculoskeletal adaptations based on type of skiing. Skiers endure a variety of intense physical forces yet remain understudied despite high orthopedic injury rates. This study serves to broaden

the current sports health literature and explore the physical demands and subsequent physiology of freestyle skiers.

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