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Bone mineral density and body composition in high-performing cricket players; an exploratory study

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Abstract

Background/Aim: Cricket is a popular sport both in New Zealand, and internationally. Cricketers have a high prevalence of stress fractures, which may in part be linked to bone mineral density. However, little research exists investigating bone health in this group. The primary aim of this study was to investigate determinants of bone mineral density (BMD) in a group of high-performing cricketers. Secondary aims included measuring musculoskeletal differences in the dominant versus non-dominant arm, and monitoring pre and postseason body composition.

Methods: Healthy male (n=27) and female (n=11) cricketers aged 16-33y were recruited. BMD was measured using DXA, and body composition was measured pre and post-season using bioelectrical impedance analysis (BIA). Food frequency questionnaires (FFQ's) and a lifestyle & health questionnaire were completed. Determinants of BMD were tested using hierarchical multiple regression analysis. A dependent samples t-test was used to determine differences between dominant and non-dominant arms and changes in body composition over the season.

Results: Skeletal muscle mass was a significant predictor of BMD and accounted for 31, 18, and 38 percent of BMD variation at the hip, spine, and total body, respectively. Age and calcium intake did not predict BMD at any site. BMD and lean mass were significantly greater ($p<0.05$) in the dominant arms of both males (+0.056g/cm^2 and +308.4g) and females (+0.078g/cm^2 and +254.2g). A 0.8kg reduction in post-season skeletal muscle mass was found in females ($p<0.05$), with no differences found in males.

Conclusions: Skeletal muscle was the strongest predictor of BMD in this group, while age and calcium intake showed no effect. Significant differences in BMD and lean mass were observed between dominant and non-dominant arms. Skeletal muscle in males remained unchanged from beginning to end of season, and was reduced in females. Training methods in this group should target development and maintenance of muscle mass in order to optimise BMD.

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List of abbreviations

BIA: Bioelectrical Impedance Analysis

BMC: Bone Mineral Content

BMD: Bone Mineral Density

BMI: Body Mass Index

Cm: Centimetre

CSA: Cross-sectional area

DXA: Dual X-ray Absorptiometry

FFM: Fat Free Mass

FFQ: Food Frequency Questionnaire

GFR: Glomerular filtration rate

IGF-I: Insulin-Like Growth Factor-I

IU: International units

Kg: Kilogram

Mcg: Micrograms

Mg/dL: milligrams per decilitre

Nmol/L: Nanomol per litre

UcOC: Under-Carboxylated Osteocalcin

UVB: Ultraviolet B

NASA: National Aeronautics and Space Administration

RDI: Recommended Dietary Intake

SD: Standard Deviation

SMM: Skeletal muscle mass

P: p-value (statistical analysis)

PTH: Parathyroid hormone

UL: Tolerable Upper Intake level

µg: Microgram

Contributions to research

Researchers	Contributions to the thesis
Corey Payne	Main researcher, data collection, data entry, statistical analysis, interpretation and discussion of results
Shelley McDonald	Co-ordination of participant recruitment, DXA testing, data collection, participant liaison
Dr Kathryn Beck	Main academic supervisor, data collection, guidance with structure, content, and statistical analysis, questionnaire design, interpretation of results, editing and formatting
Dr Pamela von Hurst	Academic supervisor and assistance with statistical procedures and analysis, DXA testing, BMD expertise, interpretation of results, editing and formatting
Owen Mugridge	DXA testing, equipment calibration, data analysis
P.C Tong	DXA testing and analysis, equipment calibration, assistance with online questionnaires, data storage
Julie Knight	DXA testing