Exploring the Role of Mental Toughness in Bone Mineral Content: A Preliminary Study

MARISSA ZENO[1], TOMAS CHAPMAN-LOPEZ[2], RICARDO TORRES[2], JORDAN LEDINGTON[2], MADELIN R. SIEDLER[3], CHRISTIAN RODRIGUEZ[3], JEFFREY FORSSE[2], GRANT M. TINSLEY[3], & ANDREAS STAMATIS[1,4], FACSM

[1]Health & Sport Sciences; University of Louisville; Louisville, KY
[2]Integrated Laboratory of Exercise, Nutrition, and Renal Vascular Research, Health Human Performance and Recreation; Baylor University; Waco, TX
[3]Kinesiology & Sport Management; Texas Tech University; Lubbock, TX
[4]Sports Medicine; University of Louisville Health; Louisville, KY

Category: Undergraduate

Advisor / Mentor: Stamatis, Andreas (andreas.stamatis@louisville.edu)

ABSTRACT

Bone mineral content (BMC), a measure of the mineral content within a person's bones, is an important parameter in the assessment of bone health. Changes in BMC can be indicative of bone-related conditions. Dual-energy X-ray absorptiometry (DXA) is one of the most widely used and accurate methods for measuring BMC. Sex, age, race, and BMI are known to influence BMC. Physical activity is positively related to BMC levels. *Mental toughness* (MT) is conceptualized as a state-like psychological resource conducive to goal-oriented pursuits and is positively linked to physical activity outcomes. The relationship between MT and BMC has not been explored. **PURPOSE**: To investigate the isolated effect of MT on BMC after eliminating the confounding effects of sex, age, race, and BMI. **METHODS**: A total of 95 individuals participated in the study across two study sites. The sample (M_{age} = 34.57, SD = 15.87) was predominantly White (64%), normal weight/overweight (M_{BMI} = 25.96, SD = 4.88) males (54%). DXA scans were performed on calibrated scanners using standard procedures. MT was assessed via the Mental Toughness Index (MTI). To reduce measurement error, the MTI was administered twice, separated by a two-week interval. A linear regression model was used to analyze the relationship between BMC and the average of the two MTI scores, while controlling for sex, age, race, and BMI in MATLAB (R2023a). A Cohen's d for MT and BMC was additionally conducted. **RESULTS**: The linear regression model was BMC ~ 1 + Sex + Age + Race + BMI + MT. The overall regression was statistically significant (R^2 = 0.183, $F(94, 88)$ = 2.78, p = .012). MT was found to significantly predict BMC (β = 0.093, p = .008, d = 2.7). **CONCLUSION**: The findings underscore the statistical significance of MT as a predictor of BMC, even when accounting for the influence of sex, age, race, and BMI. The effect size points to the practical significance of this relationship, suggesting that individuals with higher MT levels may exhibit greater BMC. Future investigations should consider incorporating demographic covariates to gain deeper insights into these relationships and conduct interventional studies to identify potential underlying mechanisms (e.g., how trainable MT could be linked, to some degree, with an increase in BMC).