

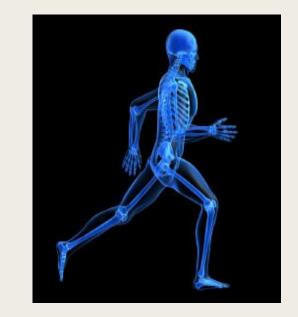


Herbert, A.J¹., Williams, A.G.^{1,5}, Lockey, S.J¹., Erskine R.M.², Sale, C.³, Hennis, P.J.³, Antrobus, M.R.^{1,6}, Brazier, J.^{1,7}, Heffernan, S.M.⁴, Day, S.H.¹ & Stebbings, G.K.¹

¹MMU, Crewe, UK, ²LJMU, Liverpool, UK, ³NTU, Nottingham, UK, ⁴UCD, Dublin, Ie, ⁵UCL, London, UK, ⁶UON, Northampton, UK, ⁷UH, Hatfield, UK.

INTRODUCTION:

- Endurance runners tend to have high total and/or loading sitespecific bone mineral density (BMD) (Scofield & Hecht, 2012).
- BMD is approximately 50-85% heritable (Ralston & Uitterlinden, 2010).
- Little is known about which specific genes are involved, whether particular genotypes are sensitive to mechanical loading and the impact of such an interaction on BMD.
- This study investigated if high-level endurance runners possess enhanced BMD associated with an "advantageous" genetic predisposition, via a potential gene-training interaction.











<u>Herbert, A.J</u>¹., Williams, A.G.^{1,5}, Lockey, S.J¹., Erskine R.M.², Sale, C.³, Hennis, P.J.³, Antrobus, M.R.^{1,6}, Brazier, J.^{1,7}, Heffernan, S.M.⁴, Day, S.H.¹ & Stebbings, G.K.¹

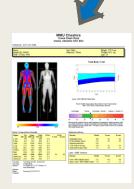
¹MMU, Crewe, UK, ²LJMU, Liverpool, UK, ³NTU, Nottingham, UK, ⁴UCD, Dublin, Ie, ⁵UCL, London, UK, ⁶UON, Northampton, UK, ⁷UH, Hatfield, UK.

METHOD:

- Total BMD (TBMD) and leg BMD (LBMD) measured via Dualenergy X-ray absorptiometry in 68 high-level Caucasian marathon runners (males < 2 h 45 min, n = 37; females < 3 15 min, n = 31) was compared with 45 male and 41 female nonathletes.
- Specific genetic variants were then investigated singularly, and collectively, as a total genotype score (TGS) via multivariate analysis of variance.

LRP5 rs3736228	LDL receptor-related protein 5
TNFRSF11B rs4355801	TNF receptor superfamily member 11b (Osteoprotegerin)
VDR rs2228570	vitamin D (1,25- dihydroxyvitamin D3) receptor
WNT16 rs3801387	Wnt family member 16
AXIN1 rs9921222	axin 1







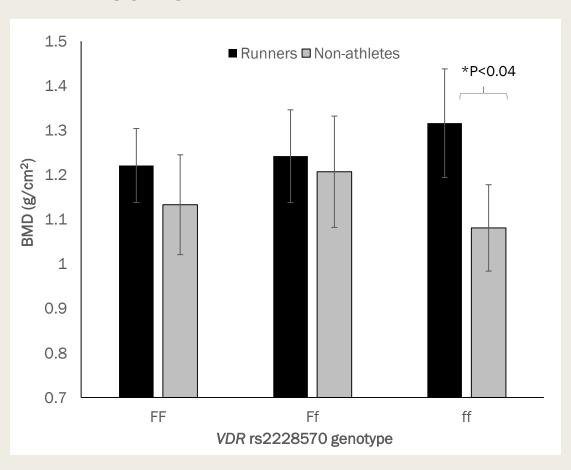




Herbert, A.J¹., Williams, A.G.^{1,5}, Lockey, S.J¹., Erskine R.M.², Sale, C.³, Hennis, P.J.³, Antrobus, M.R.^{1,6}, Brazier, J.^{1,7}, Heffernan, S.M.⁴, Day, S.H.¹ & Stebbings, G.K.¹

¹MMU, Crewe, UK, ²LJMU, Liverpool, UK, ³NTU, Nottingham, UK, ⁴UCD, Dublin, Ie, ⁵UCL, London, UK, ⁶UON, Northampton, UK, ⁷UH, Hatfield, UK.

RESULTS:



- In males, runners had ~7% higher TBMD (1.33 vs 1.28 g/cm^2 ; P<0.05) and LBMD (1.53 vs 1.43 g/cm^2 ; P<0.01) than non-athletes.
- In females, runners had ~10% higher TBMD (1.24 vs 1.16 g/cm²; P<0.01) and LBMD (1.32 vs 1.19g/cm²; P<0.01) than non-athletes.
- For VDR rs2228570, ff genotype was associated with higher TBMD in female runners but lower TBMD in female non-athletes suggesting an interaction between genotype and physical training load (*P<0.04).
- No other interactions or variants, individually or collectively as part of a TGS, were associated with BMD (P>0.10). @AdamJHerbert91





Herbert, A.J¹., Williams, A.G.^{1,5}, Lockey, S.J¹., Erskine R.M.², Sale, C.³, Hennis, P.J.³, Antrobus, M.R.^{1,6}, Brazier, J.^{1,7}, Heffernan, S.M.⁴, Day, S.H.¹ & Stebbings, G.K.¹

¹MMU, Crewe, UK, ²LJMU, Liverpool, UK, ³NTU, Nottingham, UK, ⁴UCD, Dublin, Ie, ⁵UCL, London, UK, ⁶UON, Northampton, UK, ⁷UH, Hatfield, UK.

CONCLUSION:

- High-level male and female runners possess both higher TBMD and LBMD in comparison with non-athletes.
- Consistent with most prior literature, higher BMD was observed in VDR rs2228570 FF and Ff genotypes in non-athletes, which may be due to increased biological activity associated with the F variant (Arai et al., 1997; Yasovanthi et al., 2011).
- However, our preliminary data suggest the ff genotype may be associated with enhanced TBMD in female runners via interaction with the high volume of (bone stimulating) training conducted, i.e. a gene-environment interaction.



