

Transient peak-strain matching partially recovers the age-impaired mechanoadaptive cortical bone response

Behzad Javaheri^{1,*}, Alessandra Carriero², Maria Wood¹, Roberto De Souza³, Peter D. Lee⁴, Sandra Shefelbine⁵ and Andrew A. Pitsillides¹

¹ Skeletal Biology Group, Comparative Biomedical Sciences, The Royal Veterinary College, Royal College Street, London, NW1 0TU, UK

² The City College of New York, Department of Biomedical Engineering, 160 Convent Avenue, New York, NY 10031, USA

³ Universidade Federal de Mato Grosso (UFMT), Departamento de Clínica, Av. Fernando Corrêa da Costa, 2367 - Boa Esperança, Cuiabá, 78060-900, Brazil

⁴ Manchester X-Ray Imaging Facility, University of Manchester, Research Complex at Harwell, RAL, Didcot, OX11 0FA, UK

⁵ Department of Mechanical and Industrial Engineering, Northeastern University, 360 Huntington Ave, Boston, MA 02115, USA

[*bjavaheri@rvc.ac.uk](mailto:bjavaheri@rvc.ac.uk)

Supplementary information

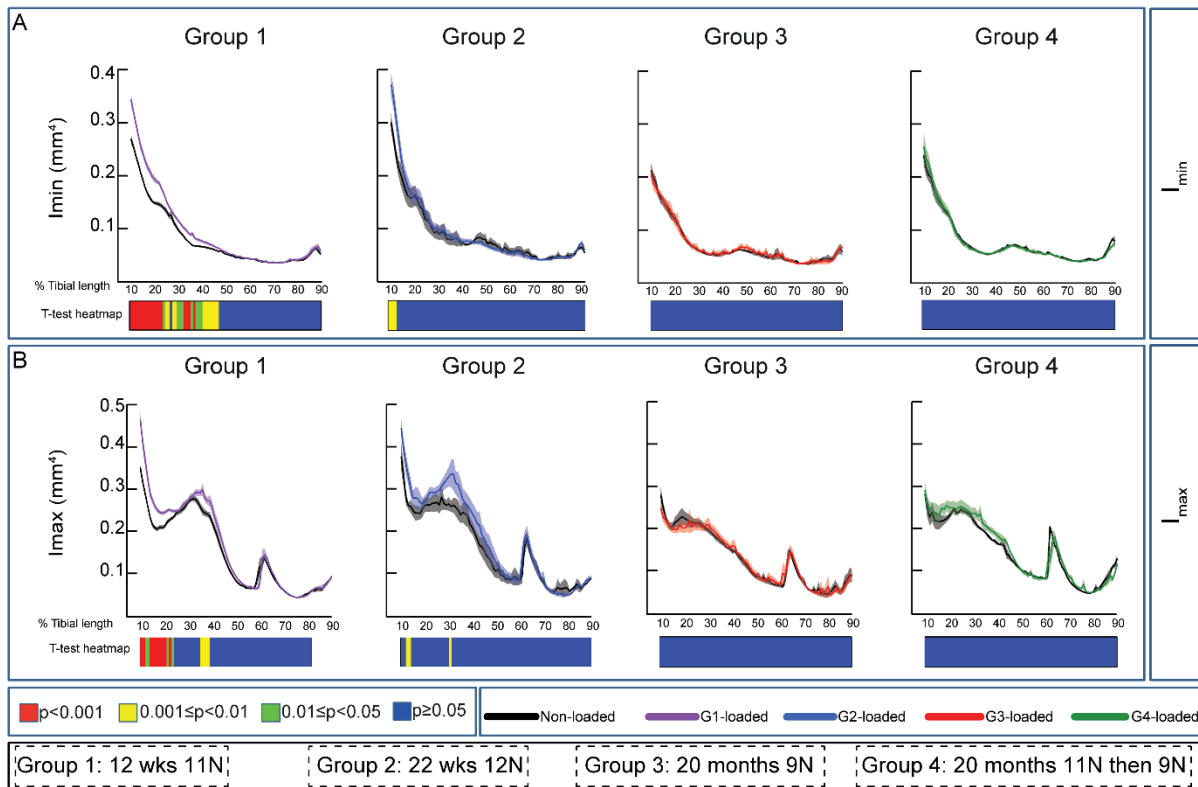


Figure 6. Analysis of I_{min} and I_{max} along the entire length of the tibia. (A) Mean I_{min} of control and loaded tibiae of female C57/B16 at 12 and 22 weeks as well as 20 months of age. (B) Mean I_{max} of control and loaded tibiae of female C57/B16 at various ages. Statistical significance of differences in CSA and thickness between control and loaded tibiae along the entire tibial shaft, represented as a heat map. Red $p < 0.001$, yellow $0.001 \leq p < 0.01$, green $0.01 \leq p < 0.05$ and blue $p \geq 0.05$. Group sizes were $n = 8$ for groups 1-3 and 4 for group 4 respectively. Group 1: 12 week-old loaded at 11N; group 2: 22 week-old loaded at 12N; group 3: 20 month loaded at 9N and group 4: 20 months old subjected to two episodes of 11N followed by two weeks of 9N. Line graphs represent means \pm SEM.

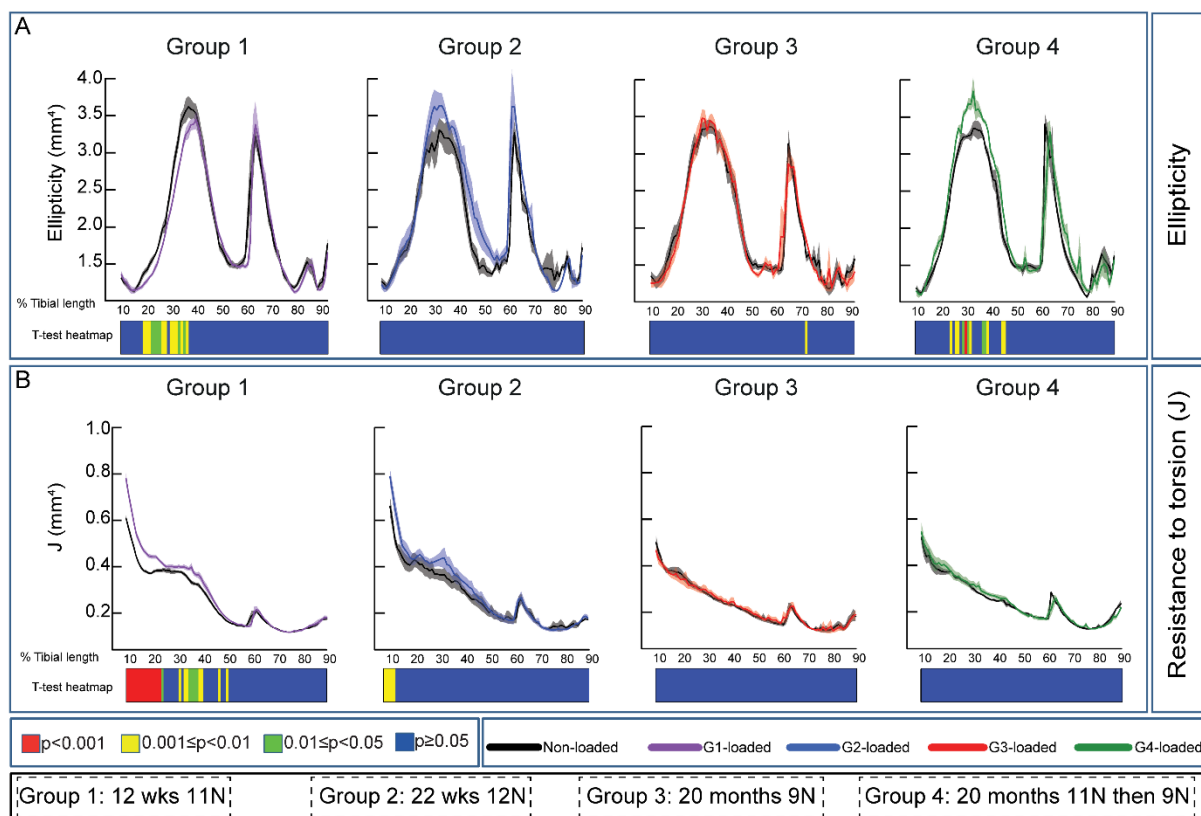


Figure 7. Analysis of ellipticity and predicted resistance to torsion (J) along the entire length of the tibia. (A) Ellipticity of control and loaded tibiae of female C57/B16 at 12 and 22 weeks as well as 20 months of age. (B) Predicted J in control and loaded tibiae of female C57/B16 at various ages. Statistical significance of differences in CSA and thickness between control and loaded tibiae along the entire tibial shaft, represented as a heat map. Red $p < 0.001$, yellow $0.001 \leq p < 0.01$, green $0.01 \leq p < 0.05$ and blue $p \geq 0.05$. Group sizes were $n = 8$ for groups 1-3 and 4 for group 4 respectively. Group 1: 12 week-old loaded at 11N; group 2: 22 week-old loaded at 12N; group 3: 20 month loaded at 9N and group 4: 20 months old subjected to two episodes of 11N followed by two weeks of 9N. Line graphs represent means \pm SEM.