University of Birmingham

Dr Daniel Espino BSc, PhD, CBiol, MSB

Lecturer in Bio-medical Engineering

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About

Daniel is a Lecturer in Bio-medical Engineering.

Daniel has published around 20 peer-reviewed journal papers and a book chapter in the field of Bio-medical Engineering, focusing on connective tissues across the body. He has received funding from the EU and the British Heart Foundation. He has been invited to give talks and demonstrate research at international meetings in the Czech Republic, France, Greece, Italy, Switzerland and the UK.

Daniel's main areas of teaching are modules on mechanics and computational modelling. His research applies mechanical testing and computational modelling to investigate connective tissues of the body.

Qualifications

- PhD in Biomedical Physics & Bio-Engineering, University of Aberdeen, 2005
- BSc, University of Aberdeen, 2001

Biography

Daniel obtained his PhD in Biomedical Physics & Bio-Engineering at the University of Aberdeen in 2005, where he obtained his BSc in 2001. As an undergraduate he was awarded the Robertson prize for Physics (University of Aberdeen, 1998) and as a post-graduate the Best Poster prize at the 9th Annual Scientific Meeting of the Institute of Physics and Engineering in Medicine (2003).

Following his PhD, Daniel was awarded a British Heart Foundation Junior Fellowship which he held at Mechanical Engineering (University of Birmingham). Subsequently he gained international experience both as a Maurice & Phyllis Paykel Research Fellow at the University of Auckland (New Zealand) and as a Marie Curie Experienced Researcher at the Laboratorio di Tecnologia Medica, Istituto Ortopedico Rizzoli (Bologna, Italy).

Daniel returned to Birmingham in 2011 as a Marie Curie Intra-European Fellow (funded through the EU FP7 framework) and in 2013 took up the position of Lecturer.

Teaching

Teaching Programmes

- Mechanical Engineering

Postgraduate supervision

Daniel is interested in supervising doctoral research students in the following areas:

- Mechanical properties of connective tissues, e.g. articular cartilage, heart valves, intervertebral discs
- Computational modelling and experimental testing of performance, failure and repair of connective tissues, in particular from the cardiovascular and musculoskeletal systems.

Research

Research Themes

Bio-medical Engineering, computational modelling and mechanical testing of connective tissues.

Research Activity

Cardiovascular research

Daniel is interested in using experimental and computational methods to investigate heart valve mechanics, failure and improved methods for surgical repair. This includes:

- the application of fluid-structure interaction to model heart valves;
- materials testing of natural heart valve components (e.g. chordae tendineae);
- design/development of heart valve simulators for testing repair techniques ex vivo (e.g. of the mitral valve).

Musculoskeletal research

Daniel is interested in using experimental and computational methods to investigate the role of connective tissues in musculoskeletal mechanics. This includes:

- materials testing of natural soft tissues (e.g. articular cartilage);

- design/development of apparatus to test stiffness/stability of joints (e.g. the knee joint);
- application of finite element analysis to study tissues (e.g. intervertebral disc modelling).

Other activities

Committees

- Conference committee member for the World Congress on Engineering, London;
- International program committee member for the 2nd Workshop on 3D Physiological Human, Switzerland;
- Technical program committee member for the International Conference on Science & Engineering in Mathematics, Chemistry and Physics, Indonesia.

Editorial Board Member

- Conference Papers in Biology;
- International Journal of Biological Engineering;
- International Journal of Engineering & Technology;
- Journal of Applied Medical Sciences;
- Open Journal of Orthopedics.

Publications

Selected Peer-Reviewed Journal Papers

Espino DM, Shepherd DET, Hukins DWL (2014). Evaluation of a transient, simultaneous, Arbitrary Lagrange Euler based multi-physics method for simulating the mitral heart valve. Computer Methods in Biomechanics and Biomedical Engineering 17: 450-458.

Wilcox AG, Buchan KG, Espino DM (2014). Frequency and diameter dependent viscoelastic properties of mitral valve chordae tendineae. Journal of the Mechanical Behavior of Biomedical Materials 30: 186-195.

Pearson B, Espino DM (2013). Effect of hydration on the frequency-dependent viscoelastic properties of articular cartilage. Journal of Engineering in Medicine 227: 1246-1252.

Ghosh S, Bowen J, Jiang K, Espino DM, Shepherd DET (2013). Investigation of techniques for the measurement of articular cartilage surface roughness. Micron 44: 179–184.

Fick JM, Espino DM (2012). Articular cartilage surface failure: an investigation of the rupture rate and morphology in relation to tissue health and hydration. Journal of Engineering in Medicine 226: 389-396.

Öhman C, Espino DM, Heinmann T, Baleani M, Delingette H, Viceconti M (2011). Subject-specific knee joint model: Design of an experiment to validate a multi-body finite element model. Visual Computer 27: 153-159.

Espino DM, Shepherd DET, Buchan KG (2007). Effect of mitral valve geometry on valve competence. Heart and Vessels 22: 109-115.

Espino DM, Shepherd DET, Hukins DWL, Buchan KG (2005). The role of chordae tendineae in mitral valve competence. Journal of Heart Valve Disease 14: 603-609.

Espino D, Meakin JR, Hukins DWL, Reid JE (2003). Stochastic finite element analysis of biological systems: comparison of a simple intervertebral disc model with experimental results. Computer Methods in Biomechanics and Biomedical Engineering 6: 243-248.

Invited book chapter

Espino DM. 2007. Polymers as replacement materials for heart valves and arteries. In: Biomedical Polymers. M Jenkins (Ed). Woodhead Publishing Ltd, Cambridge, 111-140.

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