Neil M. Thomas *DoB: July 20, 1987*

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Research to Improve Stair Climbing Safety Group (RISCS), Faculty of Science, School of Sport and Exercise Sciences, Liverpool John Moores University, Byrom Street, Liverpool, L3 3AF, UK

Research overview

With unique skill sets in biomechanics, eye tracking, and scientific data analysis and software development, I research sensorimotor control of human movement, the influences of ageing and disease, and how these interact with environmental factors. My goal is to apply knowledge gained – bridging the gap between complex laboratory-based experiments and the real-world – to inform the design and use of built environments and technologies, thus improving functional mobility and reducing the risk of falls and fall-related injuries.

Education

Lancaster University
Lancaster, UK
Ph.D. Visuomotor Neuroscience *2014 – 2017*
Thesis title: The effects of eye movements on postural control in young and older adults.
Supervised by Dr TM. Bampouras, Dr T. Donovan, Dr S. Dewhurst

University of Cumbria
Lancaster, UK
B.Sc. Sports and Exercise Science *2011 – 2014*
First class honours AA
Dissertation title: An ultrasound evaluation of human gastrocnemius fascicle architecture following fatiguing contractions.

Employment

Liverpool John Moores University
Liverpool, UK
Post-Doctoral Research Fellow *2017 – present*
Project title: Looking in the right places to prevent stair falls in older adults.
Supervised by Professor Mark Hollands

Publications

Thomas NM, Skervin T, Foster RJ, O'Brien TD, Carpenter MG, Maganaris N, Baltzopoulos V, Lees C, Hollands MA. (2020) Optimal lighting levels for stair safety: Influence of lightbulb type and brightness on confidence, dynamic balance and stepping characteristics. *Experimental Gerontology*. 132. DOI 10.1016/j.exger.2020.110839

Thomas NM, Donovan T, Dewhurst S, Bampouras TM. (2018) Visually fixating or tracking another person decreases balance control in young and older females walking in a real-world scenario. *Neuroscience Letters*. 11.677. DOI 10.1016/j.neulet.2018.04.038

Thomas NM, Dewhurst S, Bampouras TM, Donovan T, Macaluso, A, Vannozzi G. (2017) Smooth pursuits decrease balance control during locomotion in young and older healthy females. *Experimental Brain Research*. 235.9. DOI: 10.1007/s00221-017-4996-2

Thomas NM, Bampouras TM, Donovan T, Dewhurst S. (2016) Eye movements affect postural control in young and older females. *Frontiers in Aging Neuroscience*. 8.216. DOI 10.3389/fnagi.2016.00216

Thomas NM, (2016) Promoting and monitoring exercise among renal patients. *Cumbria Partnership Journal of Research, Practice and Learning*. 5.1

Thomas NM, Dewhurst S, Bampouras TM. (2015) Homogeneity of fascicle architecture following repeated contractions in the human gastrocnemius medialis. *Journal of Electromyography and Kinesiology*. 25.6. DOI 10.1016/j.jelekin.2015.08.007

Submitted:

Thomas NM, Skervin T, Foster RJ, O'Brien TD, Carpenter MG, Maganaris N, Baltzopoulos V, Lees C, Hollands MA. (May 2020) Decorating stairs safely: Influence of step-surface visual properties on confidence, anxiety, dynamic stability, and gaze behaviour. *Experimental Gerontology*.

In preparation:

Thomas NM, Skervin T, Foster RJ, O'Brien TD, Carpenter MG, Maganaris N, Baltzopoulos V, Lees C, Hollands MA. (Expected submission September 2020) Does load carrying and visual occlusion make stair negotiation unsafe?

Bampouras T, Thomas NM. (Expected submission September 2020) Accuracy of a LIDAR based player tracking system in professional football.

Foster RJ, Thomas NM. (Expected submission September 2020) Markerless motion capture to evaluate joint angles during functional movements in healthy and clinical populations.

Conference proceedings

Thomas NM, Lees C, Maganaris N, Foster RJ, O'Brien TD, Skervin T, Baltzopoulos V, Hollands MA. Lightbulb characteristics affect stepping biomechanics during stair descent in young and older adults. ISPGR world congress Edinburgh, UK, June 30 – July 4, 2019

Thomas NM, Lees C, Maganaris N, Foster RJ, O'Brien TD, Skervin T, Baltzopoulos V, Hollands MA. Low lighting drives more cautious stair descent in young adults. International Posture Symposium, Smolenice Castle, Slovakia, September 9 – 12, 2018

Thomas NM, Donovan T, Dewhurst S, Bampouras TM. Visually fixating or tracking another person decreases balance control in young and older females walking in a real-world scenario. International Posture Symposium, Smolenice Castle, Slovakia, September 9 – 12, 2018

Thomas NM, Donovan T, Dewhurst S, Bampouras TM. Eye movements affect postural control in young and older females. Annual Congress of the European College of Sport Science, Vienna, Austria, July 6 – 9, 2016

Thomas NM, Dewhurst S, Bampouras TM. Promoting and monitoring exercise among renal patients. Lancashire Teaching Hospitals Research and Innovation Showcase, Preston, UK, November 2015

Thomas NM, Dewhurst S, Bampouras TM. Homogeneity of fascicle architecture following repeated contractions in the human gastrocnemius medialis. BASES Student Conference, Portsmouth, UK, April 8 – 9, 2014

Technical skills

Human assessment: I have used a variety of methods for assessing human movement and sensorimotor control, including VR, split belt treadmills, floor contact timing with a custom-made contact mat, eye tracking, inertial measurement, dynamometry, 3- and 2-D kinematic motion capture, ultrasonography, electromyography, and electrodermal activity.

Computing & scientific data analysis: I am an active contributor to the pyCGM project, which is an open source python implementation of the conventional gait model. My contributed modules facilitate missing marker reconstructions, and segment and whole-body centre of mass calculations. I am designing a graphical user interface (GUI) based on PyQt and VTK which will enable users to visual their data, perform operations (e.g. filtering, gait event detection, margins of stability and spatiotemporal gait parameter calculations) and subsequently run the model for joint angles, centre of mass and kinetics.

During my Ph.D. I wrote two open-source GUI software applications: the sway analysis toolkit (SwAT) and a video feature logger (Flo). These analyse forceplatform and eye tracking data, respectively, and are built on C++ with Qt. I have also extensively used Psychopy to program psychophysics style experiments, such as reaction timing, stroop tests and multiple object tracking.

I have implemented a variety of advanced statistical analysis methods, such as corrected effect sizes and robust statistics using R, which is evidenced by my publications. I am familiar with many aspects of scientific data analysis and associated computing principles, including data structures, logic and algorithms, data visualisation, user interaction, and AI driven computer vision. I am proficient with Python, Matlab, R, LaTeX, C and C++. I am an advanced user of Linux, but equally comfortable with Windows and BSD type operating systems.

Hardware: I developed hardware using an Arduino microcontroller to synchronise motion capture systems with eye tracking equipment, thus enabling high resolution comparisons of eye movements and stepping characteristics necessary for determining spatiotemporal relationships between gaze and control of human movement. I also utilised an Arduino microcontroller to control an AC dimmer circuit, enabling precise control of illumination levels for research. These projects show my valuable electronic engineering skills.

Experience

Clinical: I am currently involved in a project investigating visual sampling during locomotion in children with developmental coordination disorder. I have monitored participants and collected data for an NHS service evaluation about the benefits of exercise during dialysis, for which I received runner-up poster prize at an NHS research and Innovation showcase, and I was responsible for quantitative and qualitative data processing for an Age UK project investigating lifestyle choices and physical functioning. I have also completed two placements in an NHS and a private physiotherapy clinic working alongside clinicians and vulnerable patients undergoing cardiorespiratory, musculoskeletal and neurological rehabilitation. These experiences show my proficiency working with vulnerable populations and clinicians.

Public engagement: I have cultivated links with older person's forums throughout the Northwest of England, including AgeUK and Sefton Pensioner's Advocacy, which are critical for participant recruitment, public and patient involvement in research, and rapid dissemination of research findings.

Collaborative work: My ongoing collaborators include Professor Mark Carpenter (University of British Columbia, Canada) with whom I research stair safety; Mathew Schwartz (New Jersey Institute of Technology, USA) who is the project lead for pyCGM (see 'Technical Skills'); and The Movement Sciences Group at The University of Rome Foro Italico (Italy). The latter collaboration resulted in a research project of the year award.

Professional development: I have attended numerous scholarly workshops including routes to impact (2018) and grant applications (2019), both run by the Dunhill Medical Trust (London, UK). During my PhD, I was a member of the research ethics committee, and was the post-graduate representative for the research and degree award steering group at my host institution.

Invited reviewer

Gait & Posture | PLoS one | Open Access Journal of Sports Medicine | American Journal of Physical Rehabilitation | Neuroscience Letters

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Memberships

International Society of Posture and Gait Research (Post-doc): 2019 – 2020
European College of Sport Science (student): 2015 – 2016
The British Association of Sport and Exercise Sciences (student): 2013 – 2014

Referees

Prof MA. Hollands (Post-doc Supervisor): Professor of Movement Neuroscience, Liverpool John Moores University, m.a.hollands@ljmu.ac.uk
Dr TM. Bampouras (PhD Supervisor): Lecturer in Sports Science Biomechanics, University of Lancaster, t.bampouras@lancaster.ac.uk