Engineering and Physical Sciences Research Council Doctoral Landscape Award

PROJECT TITLE: Riding the waves: Whole body vibration experienced by fast-boat crew.

Lead Supervisor: Associate Professor Genevieve Williams, G.K.R.Williams@exeter.ac.uk

Co-Supervisors:
Professor Marco Tarabini; marco.tarabini@polimi.it (Director of WE-COBOT lab, Human Performance Lab, Human vibration Lab, JRC MATT, VB Lab, Department of Mechanical Engineering, Politecnico di Milano)

https://onlineservices.polimi.it/manifesti/manifesti/contr

Webpage: https://experts.exeter.ac.uk/26622-genevieve-williams

Project details: Riding the Waves will create a step-change in our knowledge of the effects of whole-body vibration and shock (WBVS) on the human. The project will generate empirical evidence from both field (Gungston Consulting) and laboratory (Politecnico di Milano) settings to quantify the human response at the musculoskeletal, cerebral and functional performance levels. The culmination of this thesis will be to contribute to the redefinition of international safety standards (ISO 2631-1. International Standards Organization. An, N.A.I.S. and SI, S., 1997. Mechanical Vibration and Shock-Evaluation of Human Exposure to Whole-Body Vibration-Part 1: General Requirements), informing personal vibration exposure thresholds and preventative strategies to mitigate the risks associated with WBVS exposure. This proposed work bridges the existing knowledge gap between measurements of vibration and shock exposure and the response of the human. The interdisciplinary approach coupled with the state-of-the-art experimental facilities will enable the replication of real-world vibration and shock signals in laboratory settings, where we can systematically and comprehensively study the effects at different levels of the biological system. World-leading approaches to studying the neuromuscular, biomechanical and cerebral haemodynamic response to WBVS will begin to elucidate the mechanisms underpinning acute and chronic low back and neck pain, and physical and cognitive performance decrements. In the first stage of the thesis will evaluate the scientific bases, development rationale, documented limitations, and applicability of the Health Guidance Caution Zone (HGCZ) as defined in the ISO 2631-1:1997. The primary objective is to analyze the origins and scientific basis of the HGCZ and to compare them with the reported epidemiological data to address its validity and limitations. In the second stage, the work will quantify the internal dose and the resulting tissue response that ultimately leads to micro-damage, physiological disruption, and the potential development of adverse health outcomes. By exposing participants to WBVS in real world and laboratory environments the student and team will measure the neuromuscular, biomechanical and cerebral haemodynamic response. Biodynamic and statistical models will be developed to inform the final stage of the thesis. In the final stage, the thesis will develop and propose specific frequency weighting curves for assessing the risk for different body regions (low back, neck and shoulders, upper limbs, lower limbs) for different postures (sitting, standing). These weightings will be informed by the previous experimental work that predict the transmission and potential damaging effects of vibration across different frequencies on specific tissues and organs. During the thesis, the student will be included in a supportive research group who values EDI. They will experience working at both the University of Exeter Medical School and Politecnico di Milano department of Engineering. Working with our company partner Gungston Consulting, you will gain access to unique data collection environments including fast boats, as well as working experience working in an industry environment.

Project specific entry requirements: Good MSc degree in engineering, mathematics, computer science, human movement, natural sciences, sport sciences and related subjects. Preferably a Master's level degree in these areas.

Potential PhD programme of study: PhD in Biomechanics

Department: Public Health and Sport Sciences

Location: Richards Building, St Luke's Campus; Lecco Campus, Politecnici di Milano; Gungston Consulting, Southampton.

Please direct project specific enquiries to: Genevieve Williams; g.k.r.williams@exeter.ac.uk

Please ensure you read the entry requirements for the potential programme you are applying for.

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