

PGTA Project Proposal

Discipline:	Biomechanics and Motor Control
Project Title:	Diagnosis and retraining of disordered and asthmatic breathing techniques using 3D motion capture
Supervisory Team:	Dr Sam Winter Dr Matt Pain
Summary of proposed project:	<p>Disordered breathing pattern (DBP) is a major differential diagnosis versus asthma for respiratory symptoms during exercise. The prevalence of DBP is approximately 8% in the UK population. The percentage of asthma patients with comorbid DBP is between 29%-80%. Differentiating between asthma and DBP is important as treatment pathways are significantly different. However, current assessments do not objectively differentiate between one another easily and DBP patients often have a delayed time to diagnosis (between 2 – 7 years; Depiazzi & Everard, 2016).</p> <p>Opto-electronic plethysmography (OEP) is a non-invasive method for tracking chest and abdomen movement using 3D motion capture technology. OEP calculates a large number of parameters quantifying the contribution and timing of different chest wall sections. Previous work has established several novel OEP-specific parameters that differentiate between healthy, asthmatic and DBP individuals.</p> <p>The first part of this project will test novel OEP metrics using 3D motion capture systems to distinguish disordered breathing from healthy breathing and asthmatic breathing. Additionally, breathing retraining is effective in addressing symptoms and quality of life impairments (Global Initiative for Asthma, 2019) that persist despite medication (Demoly et al., 2010). Thus, the second part of this project will assess whether real-time breathing pattern feedback via OEP can restore healthy breathing patterns in those with disordered and asthmatic breathing patterns, and so reduce symptoms. This project will lay the foundation for a portable breathing monitoring and retraining system derived from OEP methodology.</p> <p>Specific research questions: 1. What OEP metrics distinguish dysfunctional and healthy breathing patterns? 2. Can asthmatic and disordered breathers use real-time feedback to alter breathing technique acutely? 3. What changes in OEP metrics are associated with acute symptom reduction in asthmatic and DBP individuals? 4. What key features of DBP breathing measured via OEP can be translated into portable technologies such as a smartphone app?</p>
Required skills, experience, and/or education:	Good inter-personal skills, experience in teaching, Biomechanics and Motor Control, Computer Science, Data Science or a related field. First Class Degree or Master's degree in a related field
Link to School research theme:	Lifestyle for Health and Wellbeing: https://www.lboro.ac.uk/schools/sport-exercise-health-sciences/research-innovation/lifestyle-for-health-and-wellbeing/health-technologies/