

# PROJECT PROPOSAL

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## 2023 Academic Entry Year – Cohort 2

### Supervisory Team

#### Primary Supervisor

Name: Professor Nicolette (Lettie) Bishop

Input (%): 50%

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#### Secondary Supervisors

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## Project Details

**Title:** The role of ethnicity on the anti-inflammatory effects of lifestyle activity and pulmonary rehabilitation in patients living with Chronic Obstructive Pulmonary Disease (COPD).

**Summary:** COPD prevalence is increasing in the UK yet once diagnosed, there are substantial disparities in the management and prognosis of COPD between individuals of South Asian and white European ethnicities, particularly regarding to referral and uptake to pulmonary rehabilitation programmes. Serious comorbidities of COPD, such as heart disease, depression and anxiety are associated with chronic systemic inflammation, yet while increasing physical activity is known to reduce these, data from COPD populations is lacking, with data from South Asian patients more scarce. This PhD will investigate the anti-inflammatory effects of lifestyle activity and pulmonary rehabilitation, and associations of this with comorbidity risk, in white European and South Asian COPD patients. In addition, qualitative methods will be used to explore the barriers and facilitators to referral and uptake to pulmonary rehabilitation in the SA community. The project and training will provide skills and knowledge in patient-centred methodologies in combination with experimental medicine, encompassing respiratory medicine, exercise immunology, exercise physiology and psychology. The project will be based in the internationally renowned National Centre for Sport and Exercise Medicine (NCSEM) at Loughborough University. The successful candidate will receive training in all assessments and techniques required for the PhD.

**Theme(s) the project most closely aligns to:** Respiratory and infectious disease. Cardiovascular, obesity and renal.

**How the PhD project and training would be appropriate for NMAHPs or GPs:** This will provide PhD level skills and knowledge in patient-centred methodologies in combination with experimental physiology and psychology techniques in an interdisciplinary approach. The supervisory team will provide exceptional mentorship and training; Bishop (exercise, inflammation) and Singh (COPD, pulmonary rehabilitation) are world-renowned experts, having supervised >30 PhD students to successful completion. Early-career researcher Paine is an AMS Springboard Award recipient, examining relationships between psychological stress, physical activity and chronic inflammation. Data collection and analysis is in the World-leading facilities of the National Centre for Sport and Exercise Medicine at Loughborough University, which hosts pulmonary rehabilitation sessions. Loughborough University's Doctoral College offers over 200 events annually to meet the requirements of the Researcher Development Framework developed by Vitae, in addition to activities hosted by the School and the Leicester NIHR BRC.

**How the project addresses health inequalities:** The 2017 British Lung Foundation briefing on health inequalities and lung disease highlighted the pressing need for strategies focussing on preventable differences in lung health outcomes across ethnicities and socioeconomic status. COPD is common in socially deprived communities, largely due to its association with smoking behaviours and air quality. Pulmonary rehabilitation, an exercise and education-based intervention, is a key treatment in the management of COPD with established benefits including improvements in symptoms and exercise capacity, reducing anxiety and improving quality of life.<sup>[1]</sup> Although prevalence of COPD in the UK is lower in South Asians (SAs) than white Europeans (WEs)<sup>[2]</sup>, there is disparity in the management and prognosis of COPD once diagnosed. For example, SAs, particularly Bangladeshi men, have amongst the highest rates

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of admissions to A&E for lung disease<sup>[3]</sup>, yet SAs are less likely to receive pulmonary rehabilitation referral compared with WEs<sup>[4]</sup>. As such, there is a lack of data relating to the benefits of pulmonary rehabilitation in SAs, which could be key to enhancing referral rates in this population. Therefore, the project will address this health inequality by (i) providing evidence and education to support the need to enhance pulmonary rehabilitation referral rates for SAs and (ii) by providing SAs with tools and information to help self-manage their health in effective, accessible, and culturally appropriate ways.

References: Nici L, et al. (2006) American Thoracic Society/European Respiratory Society statement on pulmonary rehabilitation. *Am J Respir Crit Care Med* 173(12):1390–1413. Doi: 10.1164/rccm.200508-1211ST PMID: 16760357. Gilkes, A et al. (2017) Ethnic differences in smoking intensity and COPD risk: an observational study in primary care. *npj Prim Care Resp Med* 27, 50 doi: 10.1038/s41533-017-0052-8. PMID: 28871087: 10.1164/rccm.200508-1211ST. Department of Health (2011) An Outcomes Strategy for Chronic Obstructive Pulmonary Disease (COPD) and Asthma in England Department of Health [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/216140/dh\\_128427.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/216140/dh_128427.pdf) Martin A, et al, (2012) Effect of ethnicity on the prevalence, severity, and management of COPD in general practice. *Br J Gen Pract.* 62(595):e76-81. doi: 10.3399/bjgp12X625120. PMID: 22520773

**Aim:** To assess, in South Asian and White European patients with COPD, the effect of habitual physical activity and sedentary behaviour, and participation in existing community face-to-face rehabilitation programmes on markers of chronic systemic inflammation, comorbidity risk, and quality of life compared with healthy controls or no-rehabilitation/usual care patient control group.

**Background:** The British Lung Foundation currently estimates around 1.2 million people in the UK are living with diagnosed COPD and prevalence is increasing. Several significant comorbidities of COPD are related to the associated chronic systemic inflammation, the most serious and prevalent being cardiovascular disease.<sup>[1]</sup> Anxiety and depression are also key comorbidities of COPD<sup>[2]</sup>, are associated with higher cumulative smoking and lower levels of physical activity in COPD patients<sup>[2]</sup> and add to the inflammatory burden.<sup>[1]</sup> Further, SA ethnicity is associated with higher markers of chronic inflammation independent of other inflammatory risk factors.<sup>[3,4]</sup> Increasing physical activity and reducing sedentary behaviour are known to lower markers of chronic systemic inflammation<sup>[5,6]</sup> and lower inflammatory responses to acute stress<sup>[7]</sup>, yet data from COPD populations is lacking. Pulmonary rehabilitation, incorporating exercise and education, is a key treatment in the management of COPD, yet any anti-inflammatory effects of pulmonary rehabilitation programmes are yet to be established. Limited data suggest that physical activity in patients with COPD is associated with immunological changes that may confer anti-inflammatory benefits<sup>[8,9]</sup> and a recent study of a 4-week aerobic exercise programme in a COPD mouse model found lowered serum levels of TNF-alpha, elevated levels of the anti-inflammatory cytokine IL-10 and lowered leukocyte mobilisation to an LPS challenge compared with a no exercise group.<sup>[10]</sup> Data from ethnic minority patients is even more scarce. However, our early data suggests that physical activity mitigates the adverse effects of ethnicity on immune cell migration towards sites of inflammation, suggesting a potential additional benefit of increasing physical activity for SAs with COPD.

### References:

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