

PhD Position

Job type	PhD Position
Title	Blood Flow Restriction: a novel approach to potentiate the effects of rehabilitative exercise training in COPD?
Employer	Université Grenoble Alpes
Location	Grenoble, France
Application deadline	July 16 th , 2025 (11:59pm)
Start date	November 2025
Fields	Exercise physiology, COPD, muscle function and biology
Supervisor	Dr. Julien Brugniaux, HP2, U1300, Univ. Grenoble Alpes, Inserm
Co-supervisors	Dr Clovis Chabert, LBFA, U1055, Univ. Grenoble Alpes, Inserm Dr. Mathieu Marillier, HP2, U1300, Univ. Grenoble Alpes, Inserm

Project

Background

Physical exercise combined with partial blood flow restriction (BFR), using cuffs applied at the root of a limb, reduces tissue oxygen supply (arterial blood) and the clearance of metabolic wastes (venous blood) generated during exercise. When applied at intensities of approximately 20–40% of one-repetition maximum (1RM), BFR training leads to improvements in strength, muscle mass, and muscular endurance in both healthy individuals and patients. These adaptations are of comparable magnitude to those achieved with traditional resistance training (RT, typically 65–75% 1RM), despite the exercise intensity being 2 to 3 times lower. This effect may be explained by a similar accumulation of lactate during BFR, which, reaching concentrations normally observed during high-intensity exercise, may enhance muscle adaptations. In this context, BFR appears to be a promising strategy for retraining deconditioned individuals.

While chronic obstructive pulmonary disease (COPD) is notably characterized by dyspnea (breathing discomfort), muscle dysfunction is also a frequently encountered manifestation in these patients. Strongly correlated with survival in this condition, muscle dysfunction involves not only a decrease in muscle mass, strength, and endurance but also increased fatigability, making COPD patients particularly exercise intolerant. Resistance training (RT), traditionally used in pulmonary rehabilitation, is an effective exercise modality to combat strength loss and muscle atrophy. However, because it requires lifting relatively heavy loads, it is often poorly tolerated by these patients. In this context, BFR appears to be a particularly suitable alternative to address muscle dysfunction in COPD.

Objectives / Hypotheses

The main objective of this project is to clarify the muscular mechanisms involved in adaptation to blood flow restriction (BFR) training and the associated functional benefits in patients with chronic obstructive pulmonary disease (COPD).

We hypothesize that BFR resistance training (RT-BFR) will lead to similar gains in strength, muscle mass, and muscular endurance as traditional RT, despite significantly lower exercise intensity and therefore better program tolerability.

Additionally, we hypothesize that BFR, by locally increasing intracellular metabolite, such as lactate concentrations, promotes muscle adaptations by activating both classical signaling pathways (e.g., Akt/mTOR, MurF1, MyoG, etc.) and epigenetic mechanisms (e.g., acetylation and lactylation of histone proteins) associated with this metabolite.

Keywords: Blood flow restriction, exercise, COPD, muscle dysfunction, clinical physiology

Selected bibliography:

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Where?

The successful candidate will be primarily based at the CReSI (Centre de Recherche en Santé Intégrée), a brand-new research facility, which is hosting the senior researchers of the HP2 team involved in this project and where the main tests will be conducted. The student may also be spending time at the LBFA lab for the benchtop work, located on the main UGA campus. The labs are located circa 15min away from each other (by public transport, bicycle or personal vehicle).

The candidate will also have to plan regular visits to the partner rehabilitation centers located in the greater Grenoble area.

Main activities

Full time position (100%)

Scientific monitoring, contribute to the design of the project and the drafting of the ethics documents, supervision and coordination of the rehabilitation sessions and more broadly of

the program, data collection and analysis, reporting, scientific dissemination (conference presentations and scientific articles).

Candidate

We are looking for a highly motivated candidate with good theoretical and technical skills. The candidate should be enthusiast for the project and the general field of research and is expected to have hand-on experience in at least one of the following areas: exercise testing, assessment of muscle function, vascular assessment or muscle biochemistry.

Ideally, the candidate would have a Sport Sciences degree with the Adapted Physical Activity and Health specialization (Master 2 or equivalent – STAPS, ideally curriculum in APA-S).

Skills

The candidate would need to have methodological skills in the development and implementation of experimental protocols, including data analysis, processing, and scientific writing.

Required technical skills include neuromuscular function, CPET measurement, assessment of vascular function, muscle biochemistry. Training will be provided but it would be an asset if the candidate were to already master at least one of these techniques.

Languages: proficient in French, good level in English (reading, writing and speaking).

Selection process

Applications should include a motivation letter, CV, University grades/ranking and contact details for at least one reference.

After reviewing the written applications, selected candidates will be invited for a formal interview with the supervisory team, an external expert, a representative of the Graduate School and a representative of the funding agency for final selection.

Contacts

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