In France, there are one million people with heart failure (HF) and 3.5 million with chronic obstructive pulmonary disease (COPD). Dyspnea is a major symptom in these patients. This subjective experience of breathing discomfort can gradually decrease their daily life activities, exercise capacities and can lead them gradually into a spiral of deconditioning. Cardiac or pulmonary rehabilitation is now recognized as a core component of management in patients with cardiopulmonary disease. These programs combining exercise training and therapeutic education, improve exercise capacities, symptoms and quality of life in patients with HF or COPD. Exercise training is the cornerstone of rehabilitation program.

It’s important to evaluate the walking exercise capacities to adapt and measure the impact of exercise training. A wide variety of walking tests are commonly used during rehabilitation programme. Several studies reported the endurance shuttle walking test (limit time at a given speed) was the most responsive for detecting and quantifying changes in exercise capacity after a rehabilitation programme. However, to obtain this relevant information, it is necessary to carry out three walking “shuttle” tests (including two incremental tests), which discourages many rehabilitation centers which do not have the time to carry out these tests in addition to other tests routinely used such as the 6-minute walk test (6-MWT) and the cardiopulmonary exercise testing on ergocycle. In this project, we propose a new method (Limit Time Walking Test [LTWT]) to evaluate endurance capacities without multiplying the number of tests.

**Main milestones of the thesis (approximately 12 lines):**

**STEP 1:** October 2021 to June 2023: Achievement of TTLM study in IC and COPD patients (n=100).

Each patient will realize four visits over a period of 3 to 4 weeks. During visits 1 and 2, different exercise tests will be performed: 6-minute walk test, Endurance/Incremental Shuttle Walk Tests, a cardiopulmonary exercise testing on ergocycle and other tests that can be used during a rehabilitation program (isometric strength of the quadriceps, 4-meter walk test). In addition, a measurement of daily-life physical activity by accelerometry will be performed over 7 days between visit 1 and 2 to evaluate the average daily time spent at different activity levels (sedentary, light, moderate, vigorous) and the number of daily steps. During visits 3 and 4, the LTWT will be performed several times to assess its validity, reproducibility and learning effect. During each walking test, we will measure the cardiorespiratory parameters (minute ventilation, respiratory rate, tidal volume, heart rate and pulse O2 saturation). In addition to these parameters, ECG and gas exchanges (VO2, VCO2) are measured continuously during the cardiopulmonary exercise test on ergocycle.

**STEP 2:** June 2023 to February 2024: Analysis of the results and redaction of articles.

**STEP 3:** Redaction of the thesis

- March 2024 to July 2024: Writing of the thesis and other articles.
- August 2024 and September 2024: Preparation of defense thesis.
Scientific and technical skills required by the candidate (2 lines):

The candidate graduated in the field of health and adapted physical activities must have the scientific and technical skills to perform the various exercise tests, the physiological measurements and to analyze the results of these data.

3 publications from the team related to the topic (last 5 years):


National and international collaborations:

**Local collaborations:**

- CHRU Brest – Hôpital de la Cavale Blanche – Service de cardiologie
- CHRU Brest – Hôpital de la Cavale Blanche – Service des explorations fonctionnelles respiratoires
- Fondation ARCHIPEL

**National and international collaborations:**

- Fédération Française de Cardiologie
- Société Française de Cardiologie
- Groupe Alvéole de la Société de Pneumologie en Langue Française
- Société française de sport santé
- European Society of Cardiology