The paper is titled "Longitudinal cardio-respiratory fitness prediction through wearables in free-living environments." It was written by Dimitris Spathis, Ignacio Perez-Pozuelo, Tomas I. Gonzales, Yu Wu, Soren Brage, Nicholas Wareham, and Cecilia Mascolo. The authors are affiliated with the Department of Computer Science and Technology at the University of Cambridge, UK, and the MRC Epidemiology Unit, School of Clinical Medicine, University of Cambridge, UK.

Abstract:

The abstract provides an overview of the study. It states that cardiorespiratory fitness (CRF) is a predictor of metabolic disease and mortality. Traditional methods of measuring CRF are costly and burdensome. The study aims to design algorithms and models that convert raw wearable sensor data into cardiorespiratory fitness estimates. The researchers validated these estimates using a large dataset from the Fenland Study and the UK Biobank Validation Study. The results show that the combination of wearables and biomarkers inputted into neural networks, yields strong correlations with ground truth measurements. The study also demonstrates the potential of using wearable data for fitness-aware patient subtyping and personalized trial recruitment.

Introduction:

The introduction discusses the importance of cardiorespiratory fitness (CRF) as a predictor of cardiovascular disease risk and other health outcomes. However, measuring CRF directly is challenging and requires specialized equipment and trained personnel. Non-exercise prediction models have been developed but have limitations in accuracy. The use of wearable devices in estimating CRF has shown promise but lacks scientific validation. The authors propose using wearable sensor data to predict CRF without the need for exercise testing.

Results:

The results section describes the study design and experimental tasks. Data from the Fenland study, including baseline measurements and longitudinal follow-up, were used. The researchers developed and validated non-exercise models for estimating VO2 max (maximal oxygen consumption) using features measured by wearable devices. The models were trained and tested on independent datasets. The results showed that the models incorporating free-living physical activity data outperformed traditional non-exercise models. The authors also demonstrated the ability of the models to predict changes in CRF over time.