In particular, to obtain data for simultaneously measured parameters, as required by the equations, the instruments used by Jonk et al. [5] were minimally invasive. Only blood samples were collected for blood gas analysis, and no other invasive tools or associated risks were identified.

The instruments also exhibited high reliability, such as the metabolic cart (for measuring VCO_2) and the acetylene uptake method (for measuring cardiac output).

In the near future, these equations, coupled with noninvasive instruments/techniques, can be utilized to study and characterize homogeneous samples of various cardiovascular pathologies on a large scale. This could further develop an objective diagnosis of CVD patients and contribute to the advancement of precision medicine in this field.

Patents

From this work, I obtained a patent for industrial invention issued by the Italian Ministry of Economic Development with the following characteristics:

Invention Patent No. 102020000025801

Patent holder: Vanni Rosalba

Patent Title: Calcolatore di flusso sanguigno polmonare (Pulmonary Blood Flow Calculator)

Classification: G16H

Filing date: October 30, 2020

Place and Date of Issue: Rome, November 25, 2022

Funding: This research received no external funding.

Data availability statement: The datasets analyzed during the current study are presented in these publicly available articles:

Jonk AM, Van Den Berg IP, Olfert IM, et al. Effect of acetazolamide on pulmonary and muscle gas exchange during normoxic and hypoxic exercise. J Physiol 579 (2007): 909-21.

Hachamovitch R, Brown HV, Rubin SA. Respiratory and Circulatory Analysis of CO2 Output During Exercise in Chronic Heart Failure. Circulation 84 (1991): 605-12.

Conflicts of interest: The author declares no conflicts of interest

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Review comments

- Insightful and Innovative Approach: This article presents a highly innovative approach to objectively characterize CHF patients using algebraic equations and measurable physiological parameters. The focus on precision and objective diagnosis is both timely and important for advancing treatment options in cardiology.
- Clear and Meaningful Comparisons: The study effectively uses comparisons among different groups, highlighting significant physiological differences between healthy individuals, non-CHF controls, and CHF patients. The data provides a clear and quantitative distinction, especially under exercise conditions, which adds depth to our understanding of CHF progression.
- Important Step for Precision Medicine: By introducing a new diagnostic method that allows objective classification of CHF patients, the authors make an impressive step toward personalized treatment approaches. This could have substantial impacts on the accuracy of CHF diagnoses and treatment planning.
- Robust Experimental Design: The choice of variables, including Qp and specific exercise levels, offers a comprehensive view of how CHF impacts patients physiologically. The inclusion of exercise metrics further strengthens the article, showing practical implications for CHF patient management.
- Highly Relevant Findings: The findings are highly relevant to the medical community, particularly those focused on cardiovascular health. This study's approach in differentiating CHF patients based on measurable parameters could serve as a benchmark for future research.
- Contributes to CHF Research and Diagnostic Methods: This work sets a new standard for CHF diagnosis by proposing an objective diagnostic approach that leverages mathematical modeling. It paves the way for future research aimed at refining CHF classification and treatment across all functional classes.
- Well-Structured and Data-Rich Analysis: The authors provide a well-structured and data-rich analysis that supports their conclusions effectively. The thorough explanation of variables and groups enhances the reader's understanding, making the article both accessible and informative.
- Potential Impact on Clinical Practice: The use of algebraic equations for assessing CHF severity in a clinical setting is a noteworthy advancement. This study has the potential to influence clinical practices by promoting a more quantifiable approach to CHF diagnosis.