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Mathematical Modelling of Human Cardiovascular-Respiratory System Response to Exercise in Rwanda

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Abstract : In this paper, we present a nonlinear dynamic model for the interactive mechanism of the cardiovascular and respiratory system. The model is designed and analyzed for human during physical exercises. In order to verify the adequacy of the designed model, data collected in Rwanda are used for validation. We have simulated the impact of heart rate and alveolar ventilation as controls of cardiovascular and respiratory system respectively to steady state response of the main cardiovascular hemodynamic quantities i.e., systemic arterial and venous blood pressures, arterial oxygen partial pressure and arterial carbon dioxide partial pressure, to the stabilised values of controls. We used data collected in Rwanda for both male and female during physical activities. We obtained a good agreement with physiological data in the literature. The model may represent an important tool to improve the understanding of exercise physiology.

Keywords : exercise, cardiovascular/respiratory, hemodynamic quantities, numerical simulation, physical activity, sportsmen in Rwanda, system
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