Development of a Computational Tool for Optimal Resting Metabolic Rate Calculation

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Resting Metabolic Rate (RMR) is a measure of body metabolism during a time period of strict and steady resting conditions. The traditional way of calculation of RMR from indirect calorimetry normally involves the manual selection of a proper data region for the oxygen consumption (VO_2) and carbon dioxide production (VCO_2) from the raw data file and the task is labor intensive and time consuming. **PURPOSE:** To develop a computational tool that can automatically determine the optimal data region to efficiently calculate the RMR. **METHODS:** 69 subjects' RMR data were collected in the Neuromuscular Research Laboratory (NMRL) at the University of Pittsburgh. To develop the algorithm for optimal region selection and RMR calculation, several properties of the data, including the length of time interval of the selected region for calculation and the standard deviation of data within the selected region and remaining region, were investigated by summary statistics. The RMR results obtained by the algorithm were compared with each original manual based result for validation purpose. Finally a software, which incorporates the algorithm with Graphic User Interface (GUI) and a database, was developed using Python PyQt framework and SQLite technology. **RESULT:** The mean length of the manually selected region was 9 min 28 sec or 568 seconds which was set to be the length of the time interval for the data region used in the algorithm. The standard deviation of data in the selected region were lower than the standard deviation of ones in the remaining regions (VO_2: 35.1 ± 16.0 vs 54.1 ± 22.8 $p<0.0$, VCO_2: 26.5 ± 12.9 vs 40.8 ± 19.4 $p<0.0$). The mean percent error of RMR between computational tool based and manual based calculation was 3.34%. **CONCLUSION:** The results show that the algorithm is able to identify the optimal data region with the least variation and the results were close to the manual based calculation. The software we developed provides an efficient way for RMR calculation. It also includes a data storage function, which will be useful in future data analysis.

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