Accuracy and precision of CPET equipment: a comparison of breath-by-breath and mixing chamber systems.

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Abstract

Cardiopulmonary exercise testing (CPET) has become an important diagnostic tool for patients with cardiorespiratory disease and can monitor athletic performance measuring maximal oxygen uptake [Formula: see text]Vo2(; max). The aim of this study is to compare the accuracy and precision of a breath-by-breath and a mixing chamber CPET system, using two methods. First, this study developed a (theoretical) error analysis based on general error propagation theory. Second, calibration measurements using a metabolic simulator were performed. Error analysis shows that the error in oxygen uptake ([Formula: see text]Vo2) and carbon dioxide production (Vco2[Formula: see text]) is smaller for mixing chamber than for breath-by-breath systems. In general, the error of the flow sensor [Formula: see text]δV, the error in temperature of expired air δT(B) and the delay time error δt(delay) are significant sources of error. Measurements using a metabolic simulator show that breath-by-breath systems are less stable for different values of minute ventilation than mixing chamber systems.

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