The Need for Reporting Metabolic Sampling Interval in Publication: An Example Using Maximal VO\textsubscript{2} Values and Running Economy

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**ABSTRACT**

**Background:** Knowledge of metabolic outcomes, such as maximal oxygen consumption (VO\textsubscript{2}) or running economy, has wide-ranging application. Metabolic outcomes are widely reported in literature yet the metabolic sampling interval (example: breath-by-breath, 30-sec average) utilized for collection is rarely ever stated. **Purpose:** The purpose of the present investigation was to probe the potential discrepancies created when analyzing running economy and VO\textsubscript{2max} raw metabolic data with four different metabolic sampling intervals. **Methods:** Five recreationally-active and endurance-trained subjects were included in the present analysis and four metabolic sampling intervals were analyzed: 30-sec average, 20-sec average, 8-breath, and 4-breath. Subjects engaged in 4-min running economy phases at 55 and 65% of their VO\textsubscript{2max} before entering into a maximal protocol purposed to elicit VO\textsubscript{2max} in 8-12 minutes. Utilizing the steady state and maximal VO\textsubscript{2} data, metabolic sampling intervals were analyzed for their effect on reported VO\textsubscript{2} values. **Results:** For running economy at 55%, there was no differences found ($f = 0.207$; $df = 1.862$; $p = 0.799$) between sampling frequencies when analyzed by repeated measures analysis of variance and corrected with Greenhouse-Geisser for a violation of sphericity. For running economy at 65%, there were also no differences found ($f = 1.456$; $df = 3$; $p = 0.799$) between sampling frequencies. For inspection, the relative VO\textsubscript{2} values were: 27.2 (±3.1), 27.9 (±4.1), 28.4 (±3.6), and 28.8 (±5.1) for the 30-sec, 20-sec, 8-breath, and 4-breath average, respectively. Maximal VO\textsubscript{2} values of 53.0 (±6.6), 55.1 (±7.2), 55.1 (±7.2), and 59.6 (±9.4) for the 30-sec, 20-sec, 8-breath, and 4-breath average, respectively, were found to be significantly different ($f = 21.062$; $df = 1.278$; $p < 0.001$) after adjusting for a violation of sphericity ($p < 0.001$). Bonferroni analysis indicated differences between the 30-sec average and all other averages and also the 20-sec and 8-breath averages when compared against the 4-breath average. The 4-breath average yielded the highest VO\textsubscript{2max} Value. Coincidentally, the 20-sec and 8-breath averages were identical. **Conclusion:** In the present investigation of raw metabolic data, sampling interval was found to impact the maximal oxygen consumption (VO\textsubscript{2max}) values but not running economy values when investigating a small sample of data with four select sampling intervals. The report of maximal VO\textsubscript{2} is rather common in the literature and knowing sample interval is vital for between-study comparison, determination of regression-related activities, or for pre-post comparison of data from the same or different labs.