

Comment on: **Beck ON, Kipp S, Byrnes WC, Kram R.** Viewpoint: Use aerobic energy expenditure instead of oxygen uptake to quantify exercise intensity and predict endurance performance. *J Appl Physiol*, in press 2017.

Title: Quantification of exercise intensity as energy expenditure: reliability and units of measurement.

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To the Editor:

The Viewpoint (1) offered by Beck and colleagues is timely and to be commended given the high number of investigations that utilize oxygen uptake-related outcome measures. When study participants are compared across different time points, for example in a crossover or intervention study design, it is typical to request that a similar diet and exercise regimen are adopted in the 48 h preceding each physiological assessment; however, in reality this may be impractical to monitor accurately. Accounting for substrate utilization within a calculation of metabolic cost therefore probably provides a more valid strategy to quantify exercise intensity (2). We have also recently shown that energy cost is a more reliable metric for quantification of running economy compared to oxygen cost in high-performing adolescent distance runners (3). The authors (1) identify that energy expenditure should be quantified as a ratio to body mass, which is also typical in the literature, but as a method of normalization for body size has been criticized (4, 5). We would therefore advocate that wherever possible an appropriate scaling exponent for the population of individuals under investigation, based upon a larger cohort of homogeneous participants (2, 5), is likely to further enhance the validity of energy expenditure measurement. Furthermore, steady state conditions are a pre-requisite for measuring \dot{E}_{aero} , too often these are assumed rather than checked (3). Finally, we would recommend that energy cost of exercise is quantified in the international standard (SI) unit for energy, kJ, rather than W or kcal.

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