Comment on Passfield et al: Defending the Use of Oxygen Uptake as a Criterion Measure for Training Load

We would like to defend the “indefensible.” While appreciating the thought-provoking article put forward by Passfield et al,1 we believe they have incorrectly criticized our choice of oxygen uptake (VO$_2$) as a criterion measure to assess the validity of common methods for quantifying training load.2 In our original paper, it was remiss of us not to explicitly justify the use of VO$_2$ as a criterion measure.2 Yet given the well-established validity of VO$_2$ as a measure of the metabolic cost of aerobic exercise, we did not consider it necessary.

Criterion-related validity evidence refers to the extent to which test scores are systematically related to an outcome criterion.3 It is recommended to select a criterion measure that is most closely related to the intended use of the method.3 In this instance, the intended use of the measure was to quantify the physical training that was completed by an individual.4 For a laboratory-based study, the selection of VO$_2$ expressed per unit of time as a criterion is in agreement with Åstrand and Rodahl.5 In their seminal text, they state that “physical work load may be assessed either by measurement of the oxygen uptake during the actual work operation or by indirect estimation of the oxygen uptake on the basis of the heart rate recorded during performance of the work” (p. 491). Despite VO$_2$ being used previously to assess the physiological responses to interval training,6 in their recent paper, Passfield et al1 raised specific concerns about the use of VO$_2$ to assess “short-high-intensity intervals.” The 3 interval sessions examined in our study each consisted of four 4-minute bouts at either 50%, 60%, or 70% maximal workload (W$_{max}$) interspersed with 2-minute of passive recovery. The energy provided for these sessions was from predominantly aerobic sources and was classified as moderate- to vigorous-intensity training.7 Granted, an anaerobic energy contribution to these training sessions would have also occurred and perhaps explains why session rating of perceived exertion reported a lower correlation with VO$_2$. We acknowledge this minor limitation. However, as per the definition of training load (dose),4 we still consider that VO$_2$ was the best and most appropriate available metric to quantify the amount of aerobic training completed each session.

After criticizing our use of VO$_2$ as a criterion, it is surprising that Passfield et al1 proposed the acute performance decrement (APD) as an alternative criterion measure for training dose without providing a strong conceptual link to the mechanisms underpinning the use of APD.8 While the authors acknowledge that further evidence validating the measure is needed, it is not clear how the APD is relevant to the training process and even less clear how the APD can be used to define the training dose. In Figure 2B of Passfield et al,1 a similar APD was observed after a 5- and 20-minute maximal effort. According to their suggestions, these 2 exercise protocols have the same training dose. This raises the question of whether APD conflates the measure of training dose with the postexercise effects (eg, fatigue). An APD could be related to various factors including not only the amount of training completed but also the nature of the protocol chosen to assess APD, each with different effects on fatigue mechanisms. As validity is centered on measuring what is purported to be measured,3 it is important to determine what APD is measuring.

Finally, Passfield et al1 appear to suggest that a finding should not be reported if it conflicts with the researchers’ opinions. The authors directly criticized our conclusion and commented that it contradicts the premise that internal measures of training load are better suited than external measures to measure training stress. It is our responsibility to accurately present the results regardless of what we believe. Nonetheless, our conclusion that, within the context of the study, the external measure (total work) was the most valid is not in contrast with the opinion that internal load is the relevant stimulus. All measures (ie, training impulse [TRIMP], session rating of perceived exertion) assessed in our study were found to be valid indicators of training load. It is just that total work showed the strongest association with VO$_2$, which was our criterion and a measure of internal load. In other words, this measure of external load was, among those examined, the one that showed the strongest relation with an internal measure. While we encourage curiosity and questioning of existing practices, we do not see how considering VO$_2$ as an invalid measure of training load for aerobic exercise is indefensible.

Katie M. Slattery, Lee K. Wallace, and Aaron J. Coutts, University of Technology, Sydney, Broadway, NSW, Australia

References

6. Seiler S, Sjursen JE. Effect of work duration on physiological and rating scale of perceived exertion responses during self-paced interval

Slattery (katie.slattery@uts.edu.au) is corresponding author.
