Common misconceptions perpetuated

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Morton and others (15) have recently investigated the prevalence of some common misconceptions in sport exercise science students to assess current teaching strategies. Those authors provided students with 10 multiple-choice questions and indicated the “correct” answers in their article. I take issue with two of the “correct” answers provided, as they seem to me to perpetuate misconceptions rather than rectify them. Specifically, the problematic answers are those given for questions 3 and 7. Question 3 asks at what percentage of maximal oxygen consumption (\(V_o_{2\text{max}}\)) is the optimal fat-burning intensity during exercise, and question 7 asks what the most important predictor of running endurance performance is.

The optimal fat burning intensity during exercise? The argument indicating an optimal fat-burning intensity zone is based largely on the respiratory exchange ratio. This ratio does not account for the significant catabolism of protein, it does not account for nonmetabolic CO\(_2\) production (via bicarbonate buffering), nor does it account for changes in CO\(_2\) capacitance as a function of exercise intensity (23). All of the above lead to the respiratory exchange ratio overestimating the contribution of carbohydrates and underestimating the contribution of fats to exercise metabolism. Most likely, the correct answer to question 3 should be answer D: 66–75% \(V_o_{2\text{max}}\). In any case, I feel the question itself is poor, because it implies by omission that the best method to lose body fat is to oxidize it via moderate-intensity exercise of an endurance nature. It remains possible that the most efficacious method by which to lose body fat is to gain muscle tissue via \(I\) hypertrophy training and 2) range of motion, also known as flexibility, training. Of course, energy intake must be also controlled for fat loss to occur. Overall, I feel that question 3 therefore perpetuates a misconception.

The “lactate threshold” is the best predictor of endurance performance? The mathematical function that best describes the lactate response versus workload is unclear. A few examples of proposed functions, however, have included intersecting straight lines (8, 19), a parabola with delay (20), a quadratic (14, 22), a double log (3), or an exponential (6, 11). The main purpose of these models has usually been to investigate, establish, or refute the existence of the so-called “lactate threshold” (20). However, such arguments have remained inconclusive (17). Notably, many of the models referred to above are curves and, hence, can show no “threshold” events except those imposed by fitting straight lines and/or by definition: i.e., 4.0 mmol/l. Nonetheless, the lactate threshold is a construct used by many to predict endurance performance. The utility of the construct in terms of the reliability of measurement has not been adequately assessed, because identified research has repeated measurements taken twice only (2, 8, 9, 24) and in one case three times (21). Results from these investigations have indicated that in trained individuals, running velocity differed by between 0.7 and 6.0 m/min at the lactate threshold (24) \([r = 0.88\) for running speed at the lactate threshold and \(r = 0.92\) at 4.0 mmol/l (8)], whereas intraclass correlation coefficients for various markers were 0.98–0.99 (21). On the other hand, \(r = 0.55\) for running speed at 4.0 mmol/l in untrained individuals (9). The utility of the construct in terms of actual exercise performance is unclear, as investigations regarding any correlation between lactate threshold markers and time to exhaustion are equivocal (e.g., Refs. 1, 4, 5, 7, 10, 12, and 13). Such results indicated \(R^2\) values ranging from 0.19 to 0.81, possibly due to the many different methods by which researchers imposed or fitted the threshold value, individual differences, biological variation, measurement error, and also the training status of the subjects of those investigations. The point of the above is that Morton and others (18) have stated the correct answer to question 7 in their misconceptions questionnaire is answer B: the lactate threshold. Other options included answer A: \(V_o_{2\text{max}}\), answer C: maximal cardiac output, answer D: muscle size, and answer E: other. Given that the question asks, ‘The most important predictor of endurance running performance is . . .’ I contend that the correct answer is answer E: other. The single best predictor of endurance running performance is a performance-based index, i.e., the three-parameter critical power assessment of Morton (16). This assertion makes fundamental sense, as it is hard to argue that a prediction based on the plasma value of lactate could possibly provide a more accurate prediction of endurance performance than an actual test of endurance performance.

REFERENCES

5. Demarle AP, Hugas AM, Sławiński JJ, Tricot VM, Koralsztein JP, Billat VL. Whichever the initial training status, any increase in velocity at lactate threshold appears as a major factor in improved time to exhaustion at the same severe velocity after training. Arch Physiol Biochem 111: 167–176, 2003.