Invited Commentary
Stuart A Binder-Macleod


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The recovery of muscle peak torque after a standardized 1-minute bout of dynamic isokinetic movements appears to be a reproducible, adjunctive measure for the assessment of local muscle performance, which can reflect local muscle adaptations induced by aerobic exercise.

References
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system to crossbridge cycling within the muscle. Although a number of sites may be simultaneously contributing to the loss in the force-generating ability of a muscle during any functional activity or test, one site may be primarily responsible for the loss of force. The specific fatigue test used not only affects the amount and rate of fatigue, but also may determine the specific mechanisms that are responsible for the fatigue. Different tests stress different sites within a muscle. Virtually all clinical fatigue tests primarily stress glycolytic pathways. Thus, it should not be surprising that changes in the oxidative pathways of a muscle are not revealed by these tests. That none of these tests stress oxidative pathways does not make them invalid. We do not know whether it is limitations in the glycolytic or oxidative pathways that limit the performance of many patients. We cannot, therefore, determine the superiority of either the fatigue or recovery tests in assessing the function of a muscle.

Furthermore, though the outlined recovery index may ultimately prove to be a valuable clinical tool, I believe that the evidence presented does not support this conclusion. First, the authors state that the strong correlation between \( \text{VO}_{2\text{max}} \) and “recovery of muscle torque at 30 seconds” may be interpreted to suggest that early recovery of muscle torque is a good predictor of “local endurance exercise-induced adaptations.” This statement suggests that \( \text{VO}_{2\text{max}} \) is a good predictor of local muscle endurance. If this is true, why not simply use the \( \text{VO}_{2\text{max}} \) as the measurement of local muscle endurance? The reason, I believe, is that, as noted by the authors, \( \text{VO}_{2\text{max}} \) is a measure of maximum aerobic capacity and not a measure of the endurance capacity of any specific muscle. Conclusions regarding the endurance of any particular muscle cannot be based on the \( \text{VO}_{2\text{max}} \) of a subject. The correlation between \( \text{VO}_{2\text{max}} \) and the recovery index, therefore, provides little evidence for the validity of the recovery index to assess the endurance ability of a muscle. In addition, the suggestion that the recovery index can measure a muscle’s adaptation to endurance training is not based on the current data. This study did not measure changes (adaptation) in performance. Rather, the study compared peak torques with the subjects’ current \( \text{VO}_{2\text{max}} \). Although the recovery index may correlate with adaptive changes in muscle histochemistry, this was not tested. I therefore believe the validity of this measure for assessing muscle endurance is yet to be proven.

Finally, I question the generalizability of the results of this study to specific patient populations. The recovery index appears to be a reliable measure within a population of nondisabled young subjects. The proposed test, as is true for all volitional fatigue tests, appears to be an inappropriate test to use to measure local changes within a muscle if the patient either is not well motivated or has a disorder that affects the central drive to the muscle (eg, a cerebrovascular accident or parkinsonism). An alternative procedure is the use of an electrically elicited fatigue test. These tests could easily be modified to allow for the calculation of a recovery index. The advantage of a test that uses electrical stimulation to produce and measure fatigue is that it localizes the site of fatigue to the peripheral components of the motor system and does not require central nervous system involvement.

In summary, I believe that more work is needed to prove the clinical validity of a recovery index for measuring muscle performance.

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References

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