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

14 Labeys MA, Downey RG, Saal PE. Intraclass correlations: there's more than meets the eye. Psychol Bull. 1983;93:586-595.

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The article by Sinacore et al shows that peak torque, percentage of decline in peak torque at the end of a fatigue test, and percentage of decline in peak torque measured every 30 seconds during the recovery period following a fatigue test can be reliably measured in a population of healthy subjects. In addition, these data show that the percentage of decline in peak force measured 30 seconds after completion of a fatigue test (recovery index) is more highly correlated with the maximum aerobic capacity (V02max) than either peak torque or percentage of decline in peak torque at the end of a fatigue test. Based on these observations, the authors state, "Recovery of peak torque after a standardized 1-minute bout of fatiguing exercise may better reflect the theoretical construct of muscle endurance capacity resulting from exercise or disease." They also suggest that because fatigue indexes are sensitive to the physiological adaptations that are associated with changes in the fatiguability of a muscle, these indexes may not be valid measures of muscle endurance.

I disagree with the argument that the recovery index is a better tool for measuring muscle endurance. Muscle endurance is the complement of muscle fatigue. Muscle fatigue can be defined as a decrease in the force-generating ability of a muscle resulting from recent activation.12 Fatigue may result from failure anywhere along the pathway involved in muscle activation, from the central nervous...
Virtually all clinical fatigue tests primarily stress glycolytic pathways. 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 VO$_{2}$max and "recovery of muscle torque at 30 seconds" may be interpreted to suggest that early changes in muscle function can be interpreted to suggest that early changes in muscle function are not well motivated or has a disorder loszy muscle performance. 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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