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Reliability of Time –Trial versus Time-to-Exhaustion Cycle Tests in healthy untrained subjects

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Abstract

In sport science and physiology, exercise performance tests are frequently used to examine the influence of experimental interventions on endurance performance. The reliability (or reproducibility) of performance of a test refers to the consistency or reproducibility of performance when someone performs the test repeatedly. The reliability of time-to-exhaustion and time-trial performance test protocols has not been studied extensively. To date, the studies of Jeukendrup et al (cycling) and Laursen et al. (running) are the only studies that directly compared the reliability of TTE versus TT exercise tests. The reliability of TTE versus TT in healthy untrained subjects needs to be studied since athletic status, exercise intensity and duration are factors that affect the reliability of performance tests. Therefore, the purpose of this study was 1) to evaluate the reproducibility of comparable TT and TTE tests in healthy untrained male subjects; and 2) to evaluate the performance (time to completion) in the TT and TTE test with similar intensity.

Methods: Eleven healthy male students volunteered to participate in this study. All participants performed a maximal incremental exercise test, followed by three time-trial (TT) tests and three time-to-exhaustion (TTE) tests. In three consecutive sessions, participants performed a cycle TT test at 65% W_{peak} on the Excalibur Sport ergometer. The first TT was a familiarization trial. After a 5 min 100W warm-up, participants were asked to finish the TT (total amount of work; approximately 30 min cycling) in the fastest time possible. In the TT protocol, participants received no verbal encouragement and visible information about elapsed time and pedaling rate throughout the trial. During the last three sessions of the test protocol, participants performed a TTE cycle protocol, at the same individual mean power output as the previous time trials. After the standard 5 min, 100W warm-up, participants performed a TTE cycle protocol until exhaustion. In the TTE protocol, participants received no verbal encouragement and visible information about elapsed time and pedaling rate and performed work (kJ) throughout the trial.

Results: The CV of the TT (3.4) was significantly lower than the CV of the TTE test (14.1) ($P=0.0018$). There was no difference in mean time to complete the three TT ($2029 \pm 150s$) and the mean time-to-exhaustion of the three TTE tests ($1900 \pm 974s$) ($P=0.641$). No differences were found for the time-to-completion, power, RPM, HR, %HR_{max} and RPE_{completion} of the TT the TTE tests ($p > 0.05$).

Conclusion: The main finding of this study is that the time-trial is a reliable test for performance evaluation in healthy untrained subjects. The reliability of time-to-exhaustion protocols in healthy untrained subjects was poor.

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