RECOVERY TIME BETWEEN INTERMITTENT CONTRACTIONS INFLUENCES THE RATE OF INCREASE IN MOTOR UNIT ACTIVITY AND THE TIME TO TASK FAILURE
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Introduction
The decline in muscle force during intermittent fatiguing contractions occurs more rapidly as the recovery time between contractions decreases. Longer recovery periods facilitate the recovery of intracellular processes, which delays the need to recruit additional motor units and the associated muscle fibres to maintain the required force. Accordingly, the amount of rest provided between intermittent contractions should influence the rate of activation of the motor unit pool and time to failure. The purpose of the study was to compare the effect of recovery time between intermittent contractions on the EMG activity and endurance time of a submaximal fatiguing contraction performed with the elbow flexor muscles.

Methods
Nine men performed intermittent isometric contractions at 50\% of the maximal voluntary contraction (MVC) force in two sessions. The intermittent protocol in one session consisted of repeated sets of a 6-s contraction followed by a 4-s recovery (short recovery protocol – SRP) until the target force could not be held for 6 s or the MVC force decreased to the target force. In the other session, the recovery period was 14 s (long recovery protocol – LRP). Every 2 minutes during the testing, and at task failure, an MVC was performed and stimulation was applied to the brachial plexus to assess the maximal compound action potential (M wave). EMG signals were recorded with bipolar surface electrodes that were placed over the long and short heads of biceps brachii, brachioradialis, and triceps brachii.

Results
The number of contractions performed to task failure was higher for the LRP (99 ± 24) compared with the SRP (46 ± 18; \(P < 0.05\)) for all subjects. The amplitude and duration of M wave were not altered in response during either protocol. The root mean square (RMS; \%peak MVC) at the beginning of the task was similar for the SRP (50.8 ± 10.4\%) and the LRP (47.3 ± 4.7\%). The RMS at task failure, however, was greater (\(P < 0.001\)) for the SRP (97.5 ± 16.4\%) compared with the LRP (57.9 ± 10.2\%). The rate of increase in RMS, therefore, was 48.4\% for the SRP and 11.5\% for the LRP (\(P < 0.001\)). The vertical and horizontal force fluctuations increased by 345.7 ± 188.1\% and 468.1 ± 206.3\%, respectively, at the end of the SRP compared with an increase of 163.3 ± 40.9\% and 218.3 ± 93.3\%, respectively, during the LRP (\(P < 0.01\)).

Discussion
Results indicate that net motor unit activity increased more rapidly with the shorter recovery period between consecutive isometric contractions. The absence of changes in the M wave between the two protocols suggests that the decline in force capacity was not due to an impairment of neuromuscular propagation. These findings are consistent with the interpretation that the briefer endurance time with shorter recovery intervals is attributable to the more rapid recruitment of the motor unit pool.

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