NEUROMUSCULAR FATIGUE ANALYSIS IN ATHLETES

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INTRODUCTION

Motion capture systems (MCS) can be used to assess an individual's upper-and lower-body motions, both explosive and functional in nature. Understanding an athlete's fitness-fatigue status is crucial for optimizing their sport-specific performance capabilities. So, access to data that identifies neuromuscular fatigue may help sports practitioners to make data-driven and effective decisions in managing an athlete's workloads.

PURPOSE

The purpose of this study was to identify variables about human movement at will allow for early detection of neuromuscular fatigue.

METHODS

Eleven females (X±SD; age=20.8±1.1 yrs; hgt=72.2±7.4 cm; wgt=68.0±7.2 kg) and eleven males (age=23.0±2.6 yrs; hgt=180.3±4.8 cm; wgt=80.4±7.3 kg) volunteered to participate in the present investigation. Participants were screened using a standardized movement screening protocol, consisting of 5 lower body jumping tasks (i.e. reactive strength index (RSI), contact flight time ratio during multi-hop, and unilateral jump net impulse). A three-dimensional markerless motion capture system (DARI Motion Inc, Overland Park, KS) was used to analyze the kinetic and kinematic variables of interest that

METHODS (continued)

were calculated and reported. Each participant completed one familiarization session (baseline) and a randomized acute fatiguing protocol [i.e. BOSCO; repeated vertical jump test (RVJT)]. Both acute fatiguing protocols began with each subject instructed to bend to 90 degrees and repeatedly perform maximum effort vertical jumps for the duration of the test. The BOSCO test lasted 60 secs. RVJT consisted of 15 sec jumping and 15 sec rest periods. In which subjects completed 10 sets each. An ANOVA was used for statistical analysis comparison.

Figure 1a

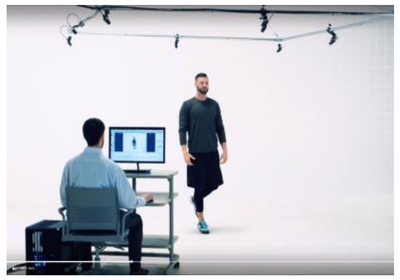

Figure 1b

Figure 1a, 1b. Displays the markerless motion capture system (MCS) used for investigation (Figure 1a) and example of MCS report used for the Functional Movement Screening (Figure 1b).

RESULTS (continued)

Data showed that the pre and post-test analysis indicated the reactive strength index (RSI) (baseline = 2.7±0.5 ; post = 1.7±0.4), contact

flight time ratio during multi hop (baseline = 1.9 ±0.6 ; post = 0.9±0.3), and unilateral jump net impulse (baseline = 248±37Ns ; post = 192±44Ns) were statistically significant from baseline.

DISCUSSIONS

The current investigation identified RSI, contact flight time ration during multi-hop, and unilateral jump net impulse are affected by neurological fatigue task (i.e. BOSCO, RVJT). However other variables were not suggesting that these variables could be used for more sensitive monitoring of athlete fatigue. Identifying biomechanical alterations following the neuromuscular fatigue tests.

PRACTICAL APPLICATION

A narrower and more simplified test can be designed and administered to help understand if an athlete is neuromuscular fatigued and alternation to their training came be made more rapidly. This may provide the strength and conditioning professional with helpful longitudinal information as an athlete, patient, or client progresses through a training program and season.