Comparison of Trunk and Hip Muscle Activation and Range of Motion between the Traditional and Landmine Romanian Deadlift

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PURPOSE

Research investigating muscle activation patterns during modifications of the Romanian deadlift is limited. The purpose of this study was to compare muscle activation patterns of the hip, trunk and shoulder during the traditional (TRDL) and landmine Romanian deadlift (LRDL) using the same relative intensity. The secondary aim of the study was to analyze the hip and trunk range of motion between the exercises due to the ability to increase posterior translation of the hips during the LRDL without loss of stability.

METHODS

Subjects. Ten male and 10 female participants (age: 24 ± 6.2 yrs; height: 171.8 ± 8.4 cm; weight: 77.5 ± 17.1 kg) with a minimum of 6 months resistance training experience volunteered and completed the study.

EMG and Motion Analysis Procedures. The participants completed a familiarization session to practice technique on each exercise followed by a session to determine an 8RM on each exercise separated by a minimum of 48 hours. Another 48 hours of rest took place before the data collection session. Muscle activity was recorded using wireless electromyography (EMG) sensors at 2000 Hz while hip and trunk range of motion were recorded using inertial measurement unit (IMU) sensors at 100 Hz. EMG and trunk and hip range of motion were time synchronized during the RDL exercises. Following a 10-min dynamic warm up and light stretching, a maximum voluntary isometric contraction (MVIC) was assessed for each muscle group (middle trapezius, latissimus dorsi, erector spinae, gluteus maximus, and biceps femoris) for data normalization. All MVICs occurred in a prone position with a 5-sec continuous contraction against straps secured to the table and manual resistance. The subjects completed three repetitions at an 8RM load for each RDL. Both exercises were executed using a free-weight barbell with the knees slightly flexed. From a standing, starting position the weight was lowered until it touched a 2-inch pad positioned on the floor before returning to the starting position.

METHODS

Statistical Analysis. EMG and IMU measures were analyzed using the SPM 1d Version 0.4 for 1-dimensional Statistical Parametric Mapping package for Matlab. Paired t-tests were used to compare the TRDL and LRDL measures during the concentric and eccentric phases with the level of significance set a priori at $p < 0.05$.

RESULTS

There were no statistically significant differences for EMG or kinematic variables between the TRDL and LRDL during the eccentric or concentric phases. Effect sizes for the EMG, lumbar flexion, and hip flexion data were trivial to small. Concentric EMG data with 95% confidence intervals are reported in Figure 1.

Figure 1. EMG RMS amplitudes during the concentric phase for the TRDL and LRDL.
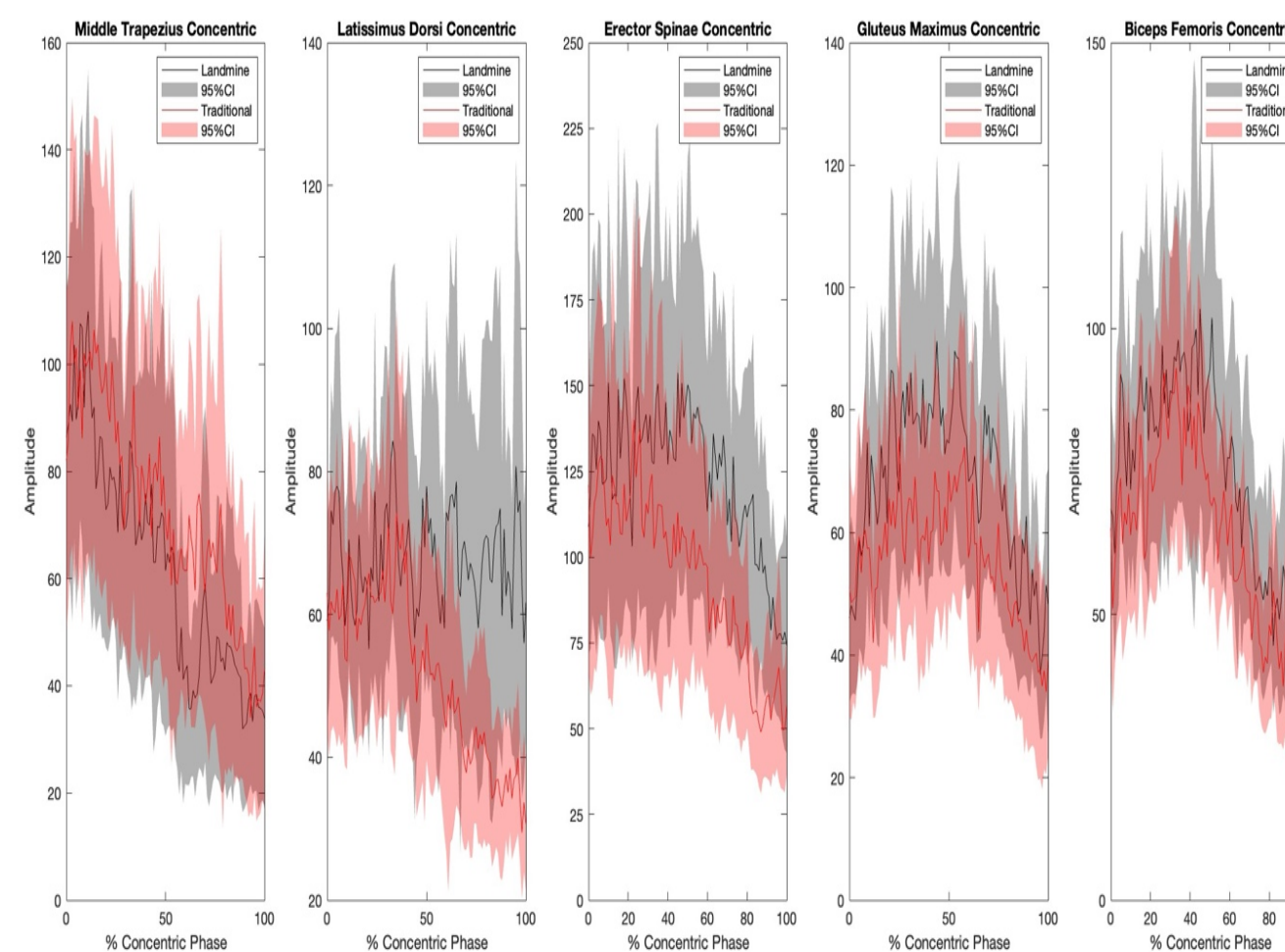
CONCLUSIONS

► The greater anterior-posterior base of support and potential to increase the posterior shift of the hips in the LRDL did not significantly affect range of motion or muscle activation compared to the TRDL.

► Relatively moderate to high activation was revealed in the lower body, core, and upper body muscle groups.

► Results were limited by the relative load, participant's training status, experience on each exercise, and predetermined depth of the lift.

PRACTICAL APPLICATIONS

► At moderately heavy loads, similar muscle activation levels will be produced with each exercise.

► While the TRDL and LRDL are exercises primarily intended to train the hip and trunk extensors, the data indicate that the latissimus dorsi and trapezius muscle groups are activated at relatively high levels with each exercise and can be included for training these muscle groups. Training studies are needed to better understand the effect of the RDL on these shoulder muscle groups.

ACKNOWLEDGEMENTS