Bilateral Electromyographic Analysis of the Sumo and Conventional Deadlift

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1. Introduction

The conventional (Fig. 1) and sumo (Fig. 2) style deadlift are an integral component of strength training programmes in athletes and are primarily used to strengthen the back, legs and hips (1). The deadlift involves the lifter standing in a flexed position with two hands gripped on a weightlifting bar. The bar is lifted until they stand erect with the knees locked and the shoulders back. These deadlift variations differ by their beginning stance and hand placement (2, 3).

Common lifting errors include a rounded lower back with kyphosis of the thoracic spine. The ability to maintain a neutral spine closely diminishes under maximal loads due to greater forces of up to 8.5% (4) generated by the hip extensor muscles than that of the erector spinae muscles. This places high tensile stress on the posterior ligaments of the spine (5). Consequently, lifting with a flexed lumbar spine increases intervertebral shear and heightens risk of intervertebral disc injury.

2. Aims

- To compare the differences in muscular EMG activity between the sumo and conventional deadlift using 60%, 70%, and 80% of one repetition maximum (1RM) weight
- To explore the asymmetrical usage of muscles during the sumo and conventional deadlift
- To compare the muscular EMG activity between the pre-activation phases (PAP) and main-activation phases (MAP) of muscles during the sumo and conventional deadlift

3.1 Methods

Participants
- Ethical approval was obtained from QMUL Ethics Committee.
- Seven participants were recruited for this study from January 2016 till May 2016.
- Mean age, height, and weight were 21.71 years (± 0.76 years), 1.74m (± 0.06m), weight 70.9kg (± 7.68kg) and 23.44 (± 2.38) respectively.
- Participants were included if they:
  i. Had at least 18 months of deadlift experience
  ii. Had experience performing the sumo & conventional deadlift
  iii. Were currently healthy with no previous injury
  iv. Had previous muscular/neuropathic lower back injury but asymptomatic for the past 6 months

Kinematic & Electromyographic measures
- CodaMotion™ active infrared motion analysis system was used to measure knee joint angles
- Participants were fitted with active infrared marker clusters attached to the legs in accordance to the Cleveland clinic protocol (7)
- 14-channel Delysio™ wireless surface EMG system was used to quantify muscle activity
- Electrodes were placed on 7 muscles bilaterally according to SENIAM guidelines (Fig. 5 & Fig. 6)

4. Results

- Significant differences in EMG activity were seen for the rhomboids between deadlift styles (p<0.05)
- Significant differences for the EMG activity were seen between the left and right biceps femoris and rectus femoris (p<0.05)
- The main activation phase EMG activity was significantly greater than the pre-activation phase for the biceps femoris and gluteus medius (p<0.0001)
- %1RM had no main effect on EMG activity (p>0.05)

4.1 Table 1. Details showing the significant results that were found for 4-way ANOVA and post-hoc analysis

5. Discussion

- Recommendations from preliminary findings include screening for leg asymmetry using simple functional strength tests such as single leg jumps and 5-hop tests with consideration of unilateral strength exercises for the weaker leg. Such test results should be taken to these recommendations due to the small sample size (11)
- Strengthening the biceps femoris and gluteus may aid post barbell lift-off
- Further research should employ multi-channel EMG to compare bilateral asymmetry of other musculature and also explore how the different deadlift grips may affect EMG muscle activity in a larger sample size