BILATERAL DIFFERENCES IN NORMALISED TRICEPS SURAE ELECTROMYOGRAMS AND GROUND REACTION FORCES DURING A PLYOMETRIC TASK

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The plyometric bounce drop jump focuses on plantar flexor muscle development, which is activated prior to contact to stiffen the joint, prevent joint collapse upon contact and perform an efficient push off phase (Bobbert et al, 1987; Dyhre-Poulsen et al, 1991). Bilateral neuromuscular comparison is required due to the tendency to touch the feet down at different times; potentially causing preferential overloading of one limb. This study aims to compare the neuromuscular contribution between left and right triceps surae in the pre-, initial- and post-contact phases of a bilateral drop jump exercise to assess the consequences of non-simultaneous foot placement.

Following ethical approval, 16 male participants (age: 25 ± 4.7 yr; height: 1.79 ± 0.05 m; body mass: 76.9 ± 8.5 kg) performed 1 set of drop jumps from 0.4m. Electromyography (EMG) activity of the soleus, medial gastrocnemius and lateral gastrocnemius of both legs was recorded using active bipolar pre-amplified disc electrodes (Biometrics, UK) (gain x 1000; input impedance >10k937;; CMRR >96dB; bandpass, 10-1000Hz; noise <5uV). The EMG signals were amplified (1000v) and sampled at 1000 Hz. The electrodes were attached to a Biometrics DataLog EMG system. Two Kistler force platforms (0.6 x 0.4m, natural frequency 1000 Hz) were used to measure the resultant ground reaction force (GRF), ground contact time and duration of the drop jumps. Peak RMS EMG amplitudes were recorded from each phase of the drop jump. The EMG data was normalised to a reference dynamic muscle action (20m sprint). Repeated measures ANOVA compared bilateral EMG activity, resultant peak GRF’s and contact durations. Pearson’s correlations (r) ascertained relationships between normalised EMG activity and contact time.

Post-contact phase EMG showed sub-maximal triceps surae activation. No differences between the muscles within and between each leg (p>0.05) were shown. Differences were evident in pre- and post-contact normalised EMG activity (p<0.01) and initial- and post-contact EMG (p<0.05). A significant relationship was found between peak resultant GRF and contact duration for both left (r = 0.65) and right leg (r = 0.66). A weak relationship was found between peak resultant GRF and non-simultaneous foot contact (r = 0.5). Minimal time differential between bilateral foot contacts showed no relationship to EMG activity. This study showed minimal differences between left and right triceps surae neuromuscular strategies engaged during a drop jump task. Differences in contact time initiation were present, however are not significant enough to cause neuromuscular differences in the plantar flexor muscles.


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