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SCI 142 Comparison of lower limb EMG activity during exercise on cycle ergometer, elliptical trainer and treadmill

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Introduction: Alternative low-impact training methods are frequently used by athletes, for cross-training or during rehabilitation. While these modalities, like running, involve cyclical patterns, it is possible that neuromuscular movement patterns vary significantly. How patterns differ is important to ensure that running motor patterns and efficiency are maintained. This study evaluated similarity between elliptical cross-trainer, cycle ergometer and treadmill running from a lower limb EMG perspective. **Methods:** Competitive male runners ($n=12$, mean \pm SD; 27 ± 5 yr, mass 77 ± 8 kg) completed randomised incremental tests to exhaustion on all three modalities separated by ~ 48 h. An additional EMG testing session at two sub-maximal loads (60 and 80% VO_{2R}) was performed; surface EMG data were recorded from gluteus maximus, vastus lateralis, semitendinosus and gastrocnemius. Discrete rmsEMG envelopes, relative to a fixed kinematic point of maximal hip flexion, at both exercise intensities were created. Mean decile data across intensity and modality was analysed using a 2-way repeated measures ANOVA, $P<0.05$ inferred significance. **Results:** Analysis revealed that activity in gastrocnemius was significantly greater on treadmill vs. cross-trainer at 60 and 80% VO_{2R} ($P<0.001$), and on cycle ergometer vs. cross-trainer at 80% VO_{2R} ($P<0.05$). Mean semitendinosus activity was significantly greater on treadmill vs. cycle ergometer and elliptical cross-trainer at both 60% VO_{2R} ($P<0.05$) and 80% VO_{2R} ($P<0.01$). Within temporally synchronised cycles, differences were present for all muscle groups; in particular gastrocnemius and semitendinosus. When running, semitendinosus recorded significantly ($P<0.001$) greater activity from 80 to 10% of the cycle compared to the other investigated modalities, however, gluteal maximus was well matched with cross-trainer data. **Discussion:** Frequent usage of elliptical cross-training could potentially lead to deconditioning of gastrocnemius and semitendinosus, leading to altered neuromuscular patterns whilst running. This could predispose an athlete to re-injury upon return to sport, however, similarity in gluteal muscle data is a positive factor from a rehabilitation perspective.