

THE INFLUENCE OF CYCLING ON LOWER LIMB MOVEMENT AND MUSCLE ACTIVATION DURING RUNNING IN TRIATHLETES

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INTRODUCTION

Triathletes report a perception of reduced lower limb coordination when running after cycling. This perceived reduction in lower limb coordination may result from interference with control of movement and muscle recruitment. Studies of upper limb coordination have demonstrated interference with control of movement when two previously learnt tasks are performed in sequence or with only short interim periods [1]. These findings can be extrapolated to suggest that control of movement and muscle recruitment in triathletes during running after cycling may be less skilled when compared to running without prior cycling because of interference with movement control. However, interference with control of movement and muscle recruitment in triathletes during running following cycling has not been studied in the absence of fatigue, which is another potential cause of altered control of movement. Therefore, this study investigated the influence of the triathlon transition on movement and muscle recruitment in highly trained triathletes using a protocol designed to provide the triathletes with exposure to cycling without causing fatigue.

METHODS

Participants were nine highly trained Australian national or international level triathletes. Pelvic and lower limb movement (three dimensional kinematics), activation of tibialis anterior (TA, surface electromyography recordings) and stride and stance durations were compared between a control run, which occurred without any prior exercise, and a transition run that was preceded by 20 min of cycling. TA activity during running and cycling was compared using coefficients of multiple correlation (CMC) to test the hypothesis that changes to muscle activity between control and transition runs resulted in activation that more closely resembled that used for cycling. Myoelectric indicators of fatigue (initial values and rate of change of the mean spectral frequency (MNF), average rectified value (ARV), and neuromuscular efficiency (NME)) were measured using a protocol previously described [2] and were used to test the hypothesis that altered TA recruitment was not due to fatigue. Furthermore, repeatability of transition effects was examined and ratings of perceived control of movement were used to investigate if athletes' perceptions of coordination were correlated with transition effects.

RESULTS AND DISCUSSION

Group data of pelvic and lower limb movement, TA EMG, and stride and stance durations did not vary between control and transition runs. Analysis of individual triathlete movement patterns also showed that motion of the pelvis and lower limb, including individual variance of movement patterns and inter-

joint coordination, did not vary in any triathlete between control and transition runs. Stride and stance durations also did not vary between control and transition runs in any triathlete. However, analysis of individual triathlete data revealed a decrease in the amplitude of TA EMG during the stance phase of running, which occurred immediately following the cycle leg and continued for the duration of the 30 min control run, in two of the nine triathletes. In these two triathletes, the pattern of activation of TA was more similar to that used for cycling (triathlete three control run-cycling CMC = 0.536 vs. transition run-cycling CMC = 0.746, and triathlete six control run-cycling CMC = 0.444 vs. transition run-cycling CMC = 0.610). Altered recruitment of TA during the transition run was not associated with myoelectric indications of fatigue as initial values and rate of change of MNF, ARV and NME did not vary between pre- and post exercise measures. Interestingly, these two triathletes were not different to the remaining seven triathletes in their ratings of perceived control of movement. Furthermore, the amplitude of TA EMG during the swing phase of running, times of EMG onset, offset and peak amplitude, EMG modulation and individual variance of EMG did not vary between control and transition runs in any triathletes. With the exception of the amplitude of TA EMG during the stance phase of running, absolute magnitudes of all kinematic and EMG variables during running did not vary between triathletes. Data of TA EMG and pelvic and limb kinematics was repeatable (CMC TA EMG = 0.846 ± 0.019 , CMC kinematics 0.911 ± 0.029).

CONCLUSIONS

This study suggests that kinematics of the pelvis and lower limb are not influenced by the transition from cycling to running in highly trained triathletes. While activation of TA was not influenced by the cycle-run transition in a majority of highly trained triathletes, the data suggest that leg muscle activity during running may be influenced by cycling in some highly trained triathletes despite years of training and practice of the sequence. Altered recruitment of TA was not associated with myoelectric indications of fatigue but was more similar to that used for cycling, suggesting that it was the cycling task that directly affected running muscle activity. This transition effect was consistent between sessions.

REFERENCES

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