

MULTIDISCIPLINE TRAINING DEMANDS MAY IMPAIR ADAPTATION OF THE NEUROMUSCULAR SYSTEM IN TRIATHLETES

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INTRODUCTION: Muscle recruitment during cycling is highly consistent and constrained in trained cyclists relative to novice cyclists (Chapman et al., 2004). This is consistent with previous evidence that adaptation of the neuromuscular system occurs with repeated performance of a motor task. Muscle recruitment in triathletes has not been investigated. Triathletes undertake similar cycling training loads to specialist cyclists, but must also undertake very high running and swimming training loads. The influence of these multidiscipline training demands on muscle recruitment remains unknown. This study compared patterns of distal lower limb muscle recruitment during cycling in triathletes, trained cyclists and novice cyclists.

METHODS: Participants were seven highly trained triathletes, nine highly trained cyclists and ten novice cyclists who had cycled 332.9 ± 47.3 , 393.9 ± 32.5 and 36.1 ± 10.3 km per week in the preceding three months, and had been cycling for 8.9 ± 1.5 , 9.4 ± 1.7 and 1.3 ± 1.3 years, respectively. Electromyographic (EMG) activity in tibialis anterior (TA), tibialis posterior (TP), peroneus longus (PL), gastrocnemius lateralis (GL) and soleus (SOL) was measured using intramuscular fine-wire electrodes. Three experimental conditions involving variations in cadence were investigated.

RESULTS: Differences were evident between triathletes and trained cyclists in recruitment patterns for all muscles, and patterns of muscle recruitment in triathletes were similar to those measured in novice cyclists. More specifically, triathletes and novice cyclists were characterized by greater variation in patterns of muscle recruitment between pedal strokes, more extensive and more variable muscle coactivation, and less modulation of muscle activity, i.e. in novice cyclists and triathletes, the relative amplitude of EMG was higher in periods between primary EMG bursts. In addition, EMG modulation decreased with increasing cadence in both triathletes and novice cyclists but was not influenced by cadence in trained cyclists. While group means for consistency of muscle recruitment and EMG modulation varied little between novice cyclists and triathletes, there was greater variability between novice cyclists for these measures, i.e. sample variance was greater.

CONCLUSIONS: These data demonstrate that muscle recruitment is less constrained in triathletes than trained cyclists despite near equal training loads. Although group mean scores for consistency of muscle recruitment and EMG modulation did not vary between triathletes and novice cyclists, greater sample variance for novice cyclists indicates that triathletes are a population distinct from novice cyclists. These findings suggest that multidiscipline training demands may impair adaptation of the neuromuscular system in triathletes. Alternatively, multidiscipline training demands may stimulate changes in muscle recruitment which optimize performance in multiple disciplines but result in patterns of muscle recruitment which differ from those utilized by trained cyclists.

REFERENCES:

Chapman, A., Vicenzino, B., Blanch, P., & Hodges, P. (2004). Patterns of distal lower limb muscle recruitment differ between trained and novice cyclists. *Medicine and Science in Sports and Exercise*, In press.

Acknowledgement

We thank Steve Dowlan for assistance with data collection.