

A WAVELET-BASED ANALYSIS OF GENDER DEPENDENT EMG PATTERNS WITHIN DIFFERENT TESTING CONDITIONS IN RUNNING

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INTRODUCTION: It has been found that women and men demonstrate different running mechanics (Ferber et al., 2003). To investigate running mechanics, different testing conditions (e.g. treadmill / overground running) are used in laboratory. EMG-signals and kinematics are considered to be different between overground and treadmill running, while the influence of gender on altered kinematics or EMG-signals remains unclear (Nigg et al., 1994; Wank et al., 1998). Therefore the purpose of this study was to get information about muscle activity and kinematics of female and male runners while running in different testing conditions in order to examine a) if there are gender dependent differences in muscle activation or kinematics and b) if the muscular / kinematical response to changes in testing conditions is gender specific.

METHOD: Six female and six male volunteers were tested running (3.0m/s) on a treadmill (TM), on a 10m laboratory track (LT) and during continuous overground running. Surface EMG was recorded (3000Hz) with unaltered electrode placement of nine muscles of the lower extremity. Kinematical data of knee and ankle joint was obtained by a high-speed camera (125Hz) in the sagittal plane and a custom-designed rear-foot goniometer in the frontal plane. Selected EMG-variables were computed based on a wavelet analysis of the signals.

RESULTS / DISCUSSION: First evaluations indicate that there are gender dependent EMG patterns for several muscles within each running condition as well as gender specific muscular responses to changes in testing condition (example of individual responses to a change from LT to TM in Fig. 1).

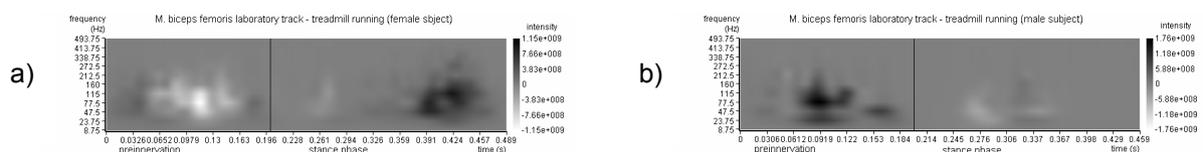


Figure 1: Gender dependent EMG response (a) female, b) male) of m. biceps femoris to the change in testing condition from LT to TM (example of a wavelet-based EMG analysis: difference patterns of activity patterns of LT- and TM-running for two subjects. Light zones indicate higher intensity in EMG-signals during running on TM, dark zones indicate higher intensity in EMG-signals during running on LT).

Further evaluation of kinematical data will be important to elucidate the discovered differences in the EMG patterns. A considerable amount of individual muscular responses to changes in running condition may be related to inter-individual differences in kinematical parameters.

REFERENCES:

- Ferber, R., McClay Davis, I., Williams, D. (2003). Gender differences in lower extremity mechanics during running. *Clinical Biomechanics*, 18, 350-357.
- Nigg, B., De Boer, R., Fisher, V. (1995). A kinematic comparison of overground and treadmill running. *Medicine and Science in Sports and Exercise*, 27, 98-105.
- Wank, V., Frick, U., Schmidtbleicher, D. (1998). Kinematics and electromyography of lower limb muscles in overground and treadmill running. *International Journal of Sports and Medicine*, 19, 455-461.