WIRE EMG OF FLEXOR HALLUCIS LONGUS DURING BAREFOOT AND SHOD RUNNING ON A TREADMILL: A PILOT STUDY

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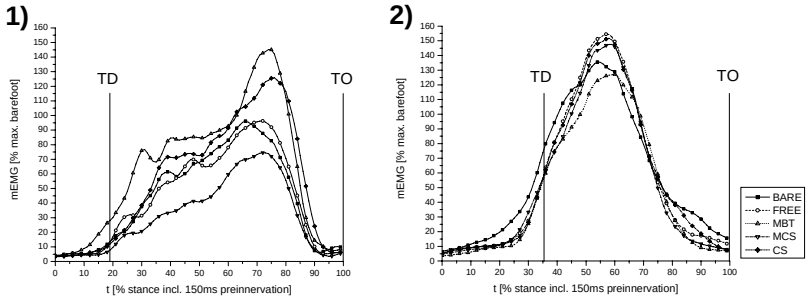
INTRODUCTION: Excessive pronation is associated with overload injuries of the lower extremity (Nigg, 1995). The flexor hallucis longus (FHL) acts against the pronation of the calcaneus (Klein, 1996). The influence of different footwear on the activity of the FHL was neither measured in walking nor running. The purpose of this study was to investigate the activity of the FHL during different phases in stance of walking and running in different footwear conditions.

METHOD: Six male volunteers (24±2yrs; 76±5kg; 180±2cm) were tested while walking (1.6m/s) and running (3.0m/s) on a treadmill (10 trials). Intramuscular EMG of the FHL (Noraxon, 1500Hz) and high-speed video (frontal 250Hz) was recorded under five different conditions: barefoot (BARE), minimal shoe (FREE), an unstable shoe (MBT), a motion control shoe (MCS) and a conventional running shoe (CS). From 150ms before touch down (TD) until the end of the stance phase (TO) the EMG-signals were filtered (20Hz high pass), rectified, smoothed and normalized to the maximum in BARE (mEMG).

RESULTS and DISCUSSION: In walking the maximum of the amplitude occurred between 60% and 80% and decreased strongly between 80% and 100% of the stance phase (Fig. 1). In running the maximum of the amplitude occurred between 50% and 65% and decreased strongly between 65% and 100% of the stance phase (Fig. 2). The FHL showed its greatest activity in the late support phase of walking and in the early support phase of running. This activity decreased in the push-off phase of walking and running.



Figures 1, 2: Average (6 subjects; 10 trials) mEMG curves of FHL during walking (1) and running (2) with the events TD, TO and preinnervation (150 ms) under different conditions.

The maximum of the amplitudes appeared earlier in running than in walking while the preinnervation was higher in running. It seems that the time-history of EMG-activity of the FHL is highly dependent on the velocity of locomotion. This study for the first time showed the EMG-activity of the FHL in running. Further analysis of integrated EMG in the different phases and its relation to kinematic information should lead to a better understanding of the role of FHL in walking and running.

REFERENCES:

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